



CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY  
REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL VALLEY REGION

# WATERSHED MANAGEMENT INITIATIVE CHAPTER



*1 December 2002*  
*with revisions as of October 2004*

*State of California*  
*California Environmental Protection Agency*  
**REGIONAL WATER QUALITY CONTROL BOARD**  
**CENTRAL VALLEY REGION**

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*1 December 2002*  
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# **Central Valley Regional Water Quality Control Board Watershed Management Initiative Chapter**

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# **CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD WATERSHED MANAGEMENT INITIATIVE PLAN CHAPTER**

## **EXECUTIVE SUMMARY**

### **Overview**

The water resource protection efforts of the State Water Resources Control Board and the Regional Water Quality Control Boards are guided by a five-year Strategic Plan. A key component of the Strategic Plan is a watershed management approach for water quality protection.

To protect water quality within a watershed context, a mix of point and nonpoint source discharges, ground and surface water interactions, and water quality/water quantity must be considered. These complex relationships present considerable challenges to water resource protection programs. The State and Regional Boards are responding to these challenges with the Watershed Management Initiative (WMI). The WMI is designed to integrate various surface and groundwater regulatory programs while promoting cooperative, collaborative efforts within a watershed. It is also designed to focus limited resources on key issues.

Past State and Regional Board programs tended to be directed at site-specific problems. This approach was reasonably effective for controlling pollution from point sources. However, with diffuse nonpoint sources of pollutants, a new regulatory approach was needed. The WMI uses a strategy to draw solutions from all interested parties within a watershed, and to more effectively coordinate and implement measures to control both point and nonpoint sources.

For initial implementation of the WMI, each Regional Board identified the watersheds in their Region, prioritized the water quality issues, and developed watershed management strategies. These strategies and the State Board's overall coordinating approach to the WMI are contained in the Integrated Plan for Implementation of the WMI. It should be recognized, however, that while the Boards are working to organize work efforts on a watershed basis, work predominately occurs on a programmatic basis.

### **Watershed Description**

The Central Valley stretches from the Oregon border to the northern tip of Los Angeles County and includes all or part of 38 of the State's 58 counties. Three major watersheds have been delineated within this region, namely the Sacramento River Basin, the San Joaquin River Basin and the Tulare Lake Basin. The three basins cover about 40% of the total area of the State and approximately 75% of the irrigated acreage. Surface water supplies tributary to or imported for use within the Central Valley, particularly the San Joaquin River and Tulare Lake basins, are inadequate to support the present level of agriculture and other development; therefore, groundwater resources within the valley are being mined to provide additional water to supply demands.

The Sacramento and San Joaquin River Basins are bound by the crests of the Sierra Nevada on the east and the Coast Range and Klamath mountains on the west. They extend over some 400 miles. The Sacramento and San Joaquin River Basins cover about one fourth of the total area of the State and contain over 43 percent of the State's irrigable land. Surface water from these two basins meet and form the Delta, which ultimately drains to San Francisco Bay. Major groundwater resources underlie both river valley floors.

The Sacramento River Basin covers 27,210 square miles. The principal streams in the basin are the Sacramento River and its larger tributaries: the Pit, Feather, Yuba, Bear and American Rivers to the east; and Cottonwood, Stony, Cache and Putah Creeks to the west. Major reservoirs include Shasta, Oroville and Folsom.

The San Joaquin River Basin covers 15,880 square miles. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

The Tulare Lake Basin comprises the drainage area of the San Joaquin Valley south of the San Joaquin River and encompasses approximately 17,650 square miles. The valley floor makes up slightly less than one-half of the total basin land area. The Kings, Kaweah, Tule, and Kern Rivers, which drain the west face of the Sierra Nevada Mountains, provide the bulk of the surface water supply native to the basin. Major reservoirs are Pine Flat, Kaweah, Success and Isabella. Imported surface water enters the Basin through the San Luis Canal/California Aqueduct System, Friant-Kern Canal, and the Delta-Mendota Canal.

### **Strategy to Implement the WMI**

The Central Valley Regional Water Quality Control Board's (Regional Board's) general watershed management approach divides the Central Valley Region into three management areas or "watersheds". These watershed management areas correspond with the three basins (Sacramento River Basin, San Joaquin River Basin, and Tulare Lake Basin) that are described above or in the Region's two Basin Plans. These watersheds can be broken down into smaller watersheds or sub-watersheds in order to work on specific problems or to focus on a specific area. The boundaries of sub-watersheds are delineated as needed.

The Regional Board is attempting to assess water quality problems in each watershed, develop and implement strategies to correct problems, and evaluate success. Inherent in the process is the need to prioritize work to maximize the use of resources. While this general process will be followed in each watershed, it is important to recognize that funding is limited and not all priorities can be set on a geographic basis.

### State of the Watershed Reports

State of the Watershed Reports have been prepared for the three watersheds and several sub-watersheds. These Reports present the current known water quality concerns in the watersheds and describe: (1) priorities within the watershed based on the known water quality problems; (2) current efforts to address the problems; (3) recommendations for future actions (including monitoring to track progress); (4) time schedules for high priority activities; and (5) preliminary budget allocations. These Reports provide the framework for discussions with stakeholders.

Staff activity in the watersheds and sub-watersheds will vary. Where possible, staff builds upon existing local programs. In the absence of local efforts, comprehensive programs may be established based upon priority issues and available funding. In some instances, significant, locally driven activity in a sub-watershed is taking place with Regional Board staff playing a minor, but important, role. In other instances, comprehensive water quality assessments are well underway and staff is implementing strategies to remedy existing problems. Staff intends to build on these activities and to do extensive outreach in each watershed to make sure that problems are adequately assessed and addressed. While voluntary efforts are encouraged, regulatory encouragement, regulation through waste discharge requirements, or enforcement activities may be required to address identified problems.

### **Organizational Structure and Programs**

The Central Valley Regional Board has broad authority and primary responsibility (shared with the State Water Resources Control Board and the eight other Regional Boards) under the Porter-Cologne Water Quality Act (Porter-Cologne) to protect water quality. Porter-Cologne establishes a comprehensive program for water quality regulation to protect the beneficial uses of water. It applies to surface waters, wetlands and groundwater and all types of waste discharge including point and nonpoint sources. Porter-Cologne requires the adoption of a Water Quality Control Plan (Basin Plan) that contains the guiding policies of water pollution management within the Region. The Regional Board implements the Basin Plan by regulating discharges of waste primarily through issuance of waste discharge requirements (WDRs). The Porter-Cologne also incorporates many provisions of the federal Clean Water Act, such as the delegation of the National Pollutant Discharge Elimination System (NPDES) permitting program.

The Central Valley Regional Board has offices in Sacramento (Headquarters Office), Fresno and Redding. The organizational structure in the three offices is largely based on the programs that are implemented. The State Water Board budget process distributes resources by program and expenditures and work commitments are set forth in workplans. It is the Regional Board's responsibility to integrate these programs on a watershed level and make distributions between the three offices. Following is a listing of the major Central Valley Regional Board programs along with current funding levels for each.

## Resources

Resources available for personnel services and contracts vary from year to year, and for fiscal year 02-03, are projected to be approximately 15% less than fiscal year 01-02. The following is the Regional Board personnel budget, as delineated in the Budget and Administration System on 1 July 2001:

<b>Program</b>	<b>Personnel Services PY Allocation</b>
<u>Watershed Management</u> : Update of the WMI Chapter and coordination of WMI activities	1.2 (0.5%)
<u>NPDES</u> : Regulation of surface water dischargers, including permitting, compliance monitoring, complaint investigations and enforcement.	31.6 (12.8%)
<u>Chapter 15</u> : Regulation of landfills, aerial pesticide applicators, industrial surface impoundments, and land treatment facilities, including permitting, compliance monitoring, complaint investigations and enforcement.	31.4 (12.8%)
<u>Non Chapter 15</u> : Regulation of land dischargers not included under Chapter 15, including permitting, compliance monitoring, complaint investigations and enforcement.	38.2 (15.5%)
<u>Stormwater</u> : Regulation of stormwater discharges from larger municipalities, and industrial and construction activities. Includes permitting, compliance monitoring, complaint investigations and enforcement.	11.6 (4.7%)
<u>WQ Certification</u> : Participation in the State Water Quality Certification process for hydrologic modification projects.	1.8 (0.7%)
<u>Regulatory Enforcement</u> : Coordination, preparation and follow-up of formal enforcement activities for regulated dischargers.	3.5 (1.4%)
<u>Dairies</u> : Regulation of confined animal operations, including permitting, compliance monitoring, complaint investigations and all enforcement.	7.1 (2.9%)
<u>Forest Activities</u> : Review and permitting of timber harvests and other forest management activities.	2.1 (0.9%)
<u>UST</u> : Oversight of investigations into groundwater pollution, corrective actions, and enforcement that may be needed as a result of leaking underground storage tanks.	27.9 (11.3%)
<u>SLIC</u> : Oversight of investigations into groundwater pollution, corrective actions, and enforcement that may be needed as a result of unauthorized discharges, including cleanup activities at Department of Energy and Department of Defense sites.	21.4 (8.7%)
<u>TMDL</u> : Development and implementation of load allocations for impaired water bodies (i.e. Clean Water Act 303(d) listed water bodies).	13.7 (5.6%)

<b>Program</b>	<b>Personnel Services PY Allocation</b>
<u>Non Point Source</u> : Review of non-regulated activities including working with stakeholders to identify water quality problems and develop and implement solutions. Includes subsurface agricultural drainage activities.	16.8 (6.8%)
<u>WQ Planning</u> : Basin plan maintenance including identification of beneficial uses and developing and updating criteria, objectives, policies, and plans for waters within the Region.	3.7 (1.5%)
<u>Monitoring &amp; Assessment</u> : Baseline/trend monitoring activities.	2.3 (0.9%)
<u>Cal FED</u> : Activities related to the CalFed program.	4.8 (2.0%)
<u>Sacramento River Watershed Program</u> : Coordination and other activities to assist the Sacramento River Watershed Program.	2.3 (0.9%)
<u>Other</u>	24.6 (10.0%)

Funding sources are usually designated for specific activities; hence, little discretion is available in distributing the funds. Moreover, some funding sources (e.g., nonpoint source and watershed) are grants that are for a limited time period. In instances where resources become available that do not have a designated use, staff consults regional priorities to determine the appropriate use of the funds. Priorities are set taking into consideration (1) legislative mandates, (2) water quality assessments and water body lists prepared in fulfillment of Federal Clean Water Act reporting requirements, (3) triennial Basin Plan reviews, (4) previous watershed management activities, and (5) dedicated funding for the issue.

Contract funds are not part of the regional staffing budget, but are awarded to outside entities. The funds are usually designated to assist in solving a water quality problem. For example, funds available through section 319 of the Clean Water Act are made available each year on a competitive basis for projects to reduce, eliminate, or prevent water pollution and to enhance water quality.

### **Key Water Quality Issues**

For the past 25 years, our resources and efforts focused on controlling major ground and surface water quality problems associated with specific point source discharges. Major regulatory programs were developed to control discharges to surface waters from wastewater treatment plants, industries, landfills and other specific sources. State and federal grant programs supported construction of wastewater treatment facilities. Other programs were developed to address thousands of ground water quality problems resulting from prior discharges from landfills, wastewater land disposal units, leaking underground and above ground tanks, military facilities, and from numerous other discrete sources. While there are not enough resources available to address all the problems from point sources, most significant water quality problems associated with them, with a few notable exceptions, are under control and should remain so as long as baseline funding is maintained.

Discharges from nonpoint sources such as agriculture, silviculture, urban runoff, past mining

activities, dairies, and individual wastewater disposal systems, now cause the most significant and widespread surface and ground water quality problems. Prior to 1997, there were very few resources available to work on nonpoint source issues. Recently, there have been resource augmentations to begin a program to control nonpoint sources of pollution. However, work is just getting started in most areas and it will be a long and costly process before nonpoint source problems are adequately addressed or adequately funded.

Following are the most significant identified water quality issues in Region 5. They are equally important and are presented in no particular order. Because of lack of monitoring and assessment resources, many more problems remain unidentified. More information is presented in the State of the Watershed Reports on past, current, and proposed future actions to address the problems.

#### *Agricultural Surface Water Discharges*

Some of the most significant surface water quality problems in the region results from nonpoint source discharges from agricultural lands. In the San Joaquin River and Sacramento River watersheds and Delta sub-watershed, there are widespread impairments resulting from elevated pesticide concentrations. Salt, selenium and nutrients are major problems in the San Joaquin River and Delta. Past efforts have focused on documenting the water quality problems. Present and future actions need to focus on developing a framework for controlling these discharges. The expiration of the current waiver policy in January 2003 greatly accelerates the timeframe for development of a regulatory framework. These efforts are only partly supported by existing resources especially with regard to addressing waiver policy issues.

#### *Storm Water Discharges*

Storm water discharges have traditionally been regulated as nonpoint sources and very limited resources were devoted to developing a program to address this issue. Storm water was recently included in the NPDES program and the larger discharges have been permitted for a few years. Storm water discharges can be high in many pollutants, including pesticides, pathogens, sediments and metals. Recent budget augmentations included specific funding for additional storm water staff. According to the Urban Runoff Taskforce estimates, the Region would need about 30 more PYs to fully implement the program.

#### *Nitrates and Salt in Ground Water*

Ground water in the San Joaquin Valley is a primary water supply in many instances but it is impaired or threatened because of elevated levels of nitrates and salts that are derived principally from irrigated agriculture, dairies, discharges of wastewater to land, and, to a lesser extent, from septic tanks. In the Sacramento Valley and foothills, discharges from septic tanks are a significant water quality concern. Conditions are expected to worsen unless significant efforts are initiated to reverse the trends. Some work is being done to assess the impacts from discharges of wastewater to land. However, monitoring is needed to identify sources and contributions. There currently are no resources available to address problems associated with agricultural sources. Very limited resources have been diverted from regulatory activities to address septic tanks but planning and nonpoint source resources are needed to develop a policy.

### Mercury from Past Mining Activity

Most of the low elevation surface water streams and lakes in the Sacramento River and San Joaquin River watersheds are impaired because of elevated levels of mercury in fish tissue. The predominate source of the mercury is past mining activities in the Coast and Sierra Nevada Range. Determining the sources, mechanisms of uptake by organisms and developing appropriate control programs is a high priority of our TMDL efforts. Control options are currently limited. Resources are needed for monitoring to identify sources in tributaries and studies are needed to determine fate, transport and bioaccumulation.

### Beneficial Uses and Water Quality Objectives

The Basin Plan defines the beneficial uses that are to be protected in point source and nonpoint source activities. If a water body's defined uses are incorrect, the environment may not be adequately protected, the Board's activities may be misdirected, or Board and discharger resources may be spent with little or no water quality benefit. Little or no data is available on water quality and other stream characteristics for most of the water bodies in the Region; much more monitoring and studies are needed.

The beneficial uses and associated water quality objectives of ephemeral, and agriculture and domestic wastewater dominated water bodies need to be reviewed both to prevent unnecessarily stringent effluent limits and to protect the unique ecology of ephemeral streams.

Water utilities are concerned that the current municipal use protection standards are not protective in light of the 1996 federal Safe Drinking Water Act, and have funded limited efforts to begin review of this issue.

### Sedimentation and Erosion

Erosion contributes to downstream water quality problems, including degraded aquatic and riparian habitat, siltation, increased temperature and changes in stream morphology. In the Central Valley, erosion is occurring from the headwaters down to the valley floor. Although naturally occurring, erosion can be accelerated by timber harvest activities, land use conversion, rural development, and grazing. Thousands of miles of streams are potentially impacted and the lack of resources has prevented a systematic evaluation and implementation of our oversight responsibilities.

Some of the problems are the result of past management practices and can not be addressed solely through regulation or best management practice implementation. Frequently, improvements in water quality, aquatic habitat and channel condition are inseparably linked. The Regional Board will direct technical assistance and grant funding to locally directed watershed programs attempting to address these issues through restoration projects and education/outreach. Forest Activities and Non Point Source resources are used to try to address these issues.

## **SECTION I. INTRODUCTION**

### **Background**

In 1995, the State and regional boards developed a Strategic Plan to provide organization-wide directions and priorities. A key element of the Strategic Plan is the Watershed Management Initiative, the primary premise of which is that Board actions and decisions should be guided by consideration of water quality related impacts within the context of a watershed. The Watershed Management Initiative, when fully implemented, will integrate watershed planning, nonpoint source management, monitoring, permit writing, compliance and enforcement, groundwater protection and other programs to promote efficient use of personnel and fiscal resources while ensuring maximum water quality protection benefits.

In 1996, the State Board, regional boards and U.S. Environmental Protection Agency prepared a *Watershed Management Initiative Plan* to implement the Watershed Management Initiative. The Plan is updated on an annual basis. Each Regional Board has prepared a chapter for the Plan and this document is the 2002 update of the chapter for the Central Valley Regional Water Quality Control Board. A key purpose of the chapter is to provide a description of how existing resources are allocated to address water quality problems and, where existing resources are inadequate, to provide support for obtaining additional resources.

### **Watershed Approach Overview**

The Central Valley Regional Board's general watershed management approach applies regionwide and includes both groundwater and surface water. The watershed management approach focuses on identifying problems and solutions for each waterbody. It takes advantage of the resources in the area. This differs from a programmatic approach which focuses on applying standards equitably to all discharges of a certain type.

Although there is some consensus that a watershed approach provides the greatest opportunity for accelerated benefits from limited funds, resources continue to be provided on a programmatic basis with requirements that make it difficult to organize the funds by watershed. An additional difficulty in the Central Valley is the sheer size of the region. The large number of watersheds, each with a wide variety of ongoing activities, makes it difficult to focus on a few for the length of time to demonstrate a benefit to a watershed approach.

Much of the work of the Board continues to be carried out in a programmatic manner. This work will be discussed in the Regionwide section. Where appropriate, the individual watershed sections will describe how the programmatic work can be integrated with ongoing watershed activities.

The process used in a watershed approach includes assessing water quality problems in each watershed, developing and implementing strategies to prevent or correct problems, and

evaluating success. All the activities to address water quality issues described in the *State of the Watershed Reports* in Section 3 of this Chapter fall somewhere on this continuum.

The Regional Board approach is a product of the vast area that must be addressed and past activities in the Region. Historically, the Regional Board and other agencies have focused limited resources on the large, important water bodies and water bodies that have the most obvious impairments. The result is that much is known about, and much activity is associated with water quality problems in the Delta, lower Sacramento River, lower San Joaquin River, and a few other water bodies that are located near significant pollutant sources (i.e., Iron Mountain Mine, Penn Mine, Sulfur Bank Mine, and Walker Mine). However, there have never been sufficient resources to fully address even these water bodies. Many of the tributaries to the mainstem rivers, the streams upstream from the major reservoirs, and most of the lakes have received little attention. Assessment of area wide ground water problems has been limited and there are no programs to comprehensively address the significant problems.

Improvements in water quality have largely been made by addressing problems associated with point source discharges. For the last 30 years, the Regional Board has expended significant resources on the point source program. However, continued and expanded efforts in compliance monitoring, permit renewals, and enforcement are still needed to assure that point source problems remain controlled or are eliminated. In contrast to past efforts, the 1996 Water Quality Assessment Report shows that nonpoint sources are now the major cause of water pollution in the Central Valley Region. Most of the surface water bodies that are listed as impaired on the 1998 Clean Water Act Section 303(d) list are impaired due to nonpoint source discharges. Moreover, the most widespread ground water problems are also the result of nonpoint source discharges.

### **Overall Goals and Objectives**

The overall goals and objectives for the Central Valley Regional Board's Watershed Management Initiative Chapter are to:

- 1) Describe how the Regional Board implements point and nonpoint source programs in a manner that compliments the activities and goals of other stakeholders in order to focus on priority watersheds, achieve water quality improvement, and promote restoration of water resources;
- 2) Present the recent, current, and future activities of staff to protect water quality;
- 3) Provide the rationale for staff priorities;
- 4) Promote voluntary watershed stewardship efforts;
- 5) Present a coordinated, comprehensive regional planning process to protect water quality; and
- 6) Present the results of assessment activities in the "State of the Watershed" reports.

## **Watershed Strategy**

The Regional Board strategy is to focus on priorities based on: (1) legislative mandates, (2) water quality assessments and water body lists prepared in fulfillment of Federal Clean Water Act reporting requirements, (3) triennial Basin Plan reviews which include public participation and comment, (4) previous watershed management activities, and (5) dedicated funding for the issue. The following are the Regional Board's priorities for the next several years.

- Continue the current level of regulatory activities in the Region.
- Develop and implement Total Maximum Daily Load Allocations as resources allow. (Current resources of approximately 13 PYs will allow us to work on TMDLs for selenium, boron and salinity in the San Joaquin River, metals in the Sacramento River, OP pesticides in the Sacramento and the San Joaquin rivers and the Delta, dissolved oxygen in the San Joaquin River and mercury in the Clear Creek watershed and the Delta.)
- Continue the current level of nonregulatory activities in the Region.
- Provide basin planning support for the review of beneficial uses, water quality objectives and implementation programs in unique situations such as ephemeral and agriculture and domestic wastewater dominated waterbodies.
- Develop and implement ambient monitoring and assessment programs to identify and/or confirm water quality impairments to surface waters and to assess the effectiveness of implementation programs in protecting groundwater.

## **Organization of the Chapter**

The chapter contains five sections and accompanying appendices.

**Executive Summary**, contains a description of the Central Valley Region, identifies key watersheds, describes the Region's basic strategy to implement the WMI, describes key regional water quality problems and presents a brief description on resources to address these problems.

**Section 1, Introduction**, includes a description of the Regional Board's general watershed management approach and explains how the sections of the chapter fit together to implement this strategy.

**Section 2, Regionwide Activities**, consists of activities organized on a regionwide, programmatic basis. This section focuses on the point source programs that are defined in a programmatic manner rather than a watershed manner. These programs include septic tank/onsite disposal, Non-Chapter 15, basin planning, water quality monitoring, nonpoint source management, dredging, water quality certification, dairy regulation, storm water regulation, NPDES regulation, and Chapter 15 (oilfields).

**Section 3, Watershed Activities**, contains *State of the Watershed Reports* for the three major watersheds in the Region (Sacramento River, San Joaquin River and Tulare Lake Basin) and for sub-watersheds in which there is focused staff activity (Pit River, North and Middle Forks of the Feather River, Cache Creek, and the Delta). Each State of the Watershed Report contains two main parts 1) *Watershed Description*; 2) *Strategies and Activities, and Resource Needs*, which describe the water quality problems and issues in the watersheds and the activities and strategies to address them including a description of priorities and resource information. There is also identification in general terms, of where additional resources are needed to fully address a water quality issue. This includes both staff resources and monitoring needs. Section 3, the State of the Watershed Reports, focuses on nonpoint source problems and programs because these programs are more amenable to a watershed approach.

The **Appendix** contains three parts: Appendix 1 the list of projects to be conducted by stakeholder groups that the Regional Board will support for grant funding. Appendix 2 describes the ongoing activities and goals of the nonpoint source program. Appendix 3 contains details of monitoring and assessment programs currently in place and anticipated in the future.

## **SECTION II. REGIONWIDE ACTIVITIES**

This section describes the water quality concerns that affect the entire region and are not confined to a single watershed. These concerns include effluent and agricultural dominated waterbodies and the impaired water body list. This section also describes programmatic activities that are not prioritized by specific watershed concerns such as basin planning, regulatory programs, tank programs, special investigation and cleanups, and Department of Energy and Defense sites.

### **Regional Description**

The Central Valley Region covers over 60,000 square miles and contains over 40% of the land and more than 75% of the irrigated acreage in California. Three major watershed are encompassed by the Region: the Sacramento River, the San Joaquin River, and the Tulare Lake Basin.

### **Watershed Management Initiative**

The Watershed Management Initiative is different than watershed management activities. The State Water Resources Control Board's Strategic Plan included a watershed management initiative goal intended to integrate water quality monitoring, assessment, planning, standard setting, permit writing, nonpoint source management, groundwater protection and other programs to promote more efficient use of personnel and fiscal resources while ensuring maximum water quality protection. The Central Valley Regional Board is committed to implementing this initiative.

The Regional Board receives funding for a watershed coordinator that is spread between our three offices to achieve maximum benefit of the resource. This funding is used to coordinate revision of the WMI chapter among the various programs in the three offices and participate in the WMI workgroup. The workgroup assures consistency between the regional chapters and works to identify and overcome constraints that inhibit a watershed management approach. The WMI chapter describes the Regional Board's approach to water quality management in the three major watersheds in the Region. It also describes the water quality issues in the individual watersheds and actions underway or needed to address them.

Since the current WMI coordinator resource is entirely allocated to WMI chapter updates and workgroup activities, no WMI resources are available to work with stakeholder groups or to assist with watershed activities. Resources from other programs are used to provide some technical assistance and guidance to local stakeholder groups.

Because of the size of the Central Valley and the three offices, additional resources should be made available to allow the coordinator to serve as a point of contact on watershed management issues and facilitate the exchange of information between watershed groups, Regional Board staff, the general public, other Regional Boards, and other agencies. The coordinator would identify unmet water quality needs and seek to coordinate programs and/or activities to meet

those needs. An additional two PYs are needed to more effectively implement the WMI by allocating one coordinator to each major watershed.

### **Watershed Activities**

The goal of the Region's watershed activities is to coordinate Regional Board programs with local stakeholder goals and activities in a complimentary manner to achieve water quality improvements and promote restoration of water resources.

There are numerous local, grass roots efforts that have been initiated to restore watersheds that have been degraded, or are threatened to be degraded, by various land use practices. Restoration efforts include stream rehabilitation, changes to existing land use practices, and improved watershed management (i.e., forest management, wildfire fuel reduction). There are more than 80 active watershed groups in our region, of which staff is working with less than half. Current watershed activities include:

- Assist stakeholder groups to identify nonpoint source (NPS) problems and help develop and implement projects to address water quality problems.
- Work with stakeholder groups to find funding sources for watershed planning and implementation projects and to assist them in framing their proposals.
- Work with stakeholder groups to design and implement monitoring programs for NPS implementation projects and to assess overall watershed conditions. Regional Board goals are to ensure that proper analytical techniques are used and quality assurance and quality control protocols are followed.
- Educate stakeholders and the general public about the value of watershed management and protection and encourage implementation of Best Management Practices (BMPs).

Current unfunded needs include:

- Expanding the level of support in watersheds where staff is currently active and expand activities into additional sub-watersheds.
- Expanding work with watershed groups to develop grant ideas and proposals.
- Working with local planning agencies and work toward bridging the gap between land use and water quality planning.
- Working closely with agencies involved in associated activities such as salmon restoration and wetland enhancement.
- Coordinating monitoring efforts within a watershed and integrating regional board programs with those of other agencies and organizations.

- Providing continuity between project development, implementation, and post-project monitoring of state or federally funded projects.

Currently, resources for working with stakeholders are culled from nonpoint source, TMDL, watershed management, basin planning, CALFED, Sacramento River Watershed Program and other programs. Although some assistance to the stakeholders can be provided from these programs, funding constraints do not allow full participation of staff in stakeholder issues. Separately from the WMI resources, an additional 1.0 PY, annually needs to be dedicated to assist stakeholders in each of the watersheds (Sacramento River, San Joaquin River and Tulare Lake Basin).

## **Regional Concerns and Issues**

### *Agricultural Dominated and Effluent Dominated Water Bodies*

It is estimated that 70% of the tributary water bodies in the valley floor are dominated by discharges from agriculture, urban areas, and NPDES facilities. This is not uncommon throughout the West where, because of the arid climate, flow in streams is often low due to limited recharge from groundwater and infrequent storm events that occur only during certain times of the year. As a result, stream flow, particularly during the summer months, can be dominated by discharge from human activities.

Beneficial uses for many tributaries are not specifically listed in the Basin Plan. In the absence of listed use designations, beneficial uses are assumed to be the same as for the first downstream water body for which beneficial uses are listed in the Basin Plan. In agricultural environments, a complex network of modified natural and constructed channels convey irrigation supplies to farms and export agricultural drainage water to natural streams. Many of these constructed and artificial channels lack the habitat and physical flow characteristics of natural channels required to sustain the full range of aquatic life and other beneficial uses. Additionally, in natural channels whose flow is dominated by agricultural drainage, water quality and hydrologic modifications may not support the full range of aquatic life and other beneficial uses. In the Sacramento and San Joaquin River Basins, it is estimated that more than 130 natural water bodies, totaling more than 1100 miles, are dominated by agricultural drainage and supply water. There are more than 4100 water bodies, totaling over 9300 miles, which are constructed facilities designed to carry agricultural drainage and supply water. There are more than 75 water bodies, totaling almost 600 miles, which are natural dry washes that have been altered to carry agricultural supply or drainage water. Water bodies that receive agricultural drainage typically support some sort of aquatic life and limited beneficial uses and may be impaired if elevated levels of pesticides and other contaminants are present. All of these water bodies are known as Agricultural Dominated Water Bodies (ADWs).

Some of the water bodies in the Sacramento River and San Joaquin River Basins are dominated by NPDES discharges; these water bodies are also known as effluent dominated water bodies (EDWs). Effluent limits for discharges to EDWs are typically set equal to the numerical objectives contained in the Basin Plan, National Toxics Rule, California Toxics Rule, or other

criteria to assure compliance with narrative water quality objectives. Meeting these limits may be difficult and expensive. In some cases, treatment plants are capable of discharging high quality effluent that would fully protect the assigned beneficial uses and yet still be in violation of the objectives. The consistent flows provided by the wastewater discharge may enhance some aquatic life beneficial uses but be detrimental to others that depend on the ephemeral nature of the stream. The flows may cause the original conditions in the stream to change, causing a shift in the uses that are actually realized within a beneficial use category (i.e. a shift from the unique uses of ephemeral waters to the general uses of a perennial water). Dischargers question the need to fully protect the general uses when it is the discharge itself that allows these uses to exist at all.

The beneficial uses of both ADWs and EDWs should be evaluated. Possible alternatives to consider are a) designating site specific beneficial uses, b) using “warm” and “cold” designations on a case by case basis rather than applying the tributary rule, c) developing an agricultural dominated or EDW beneficial use which would consist of a limited warm water habitat, recreation and/or municipal use, d) adopting site specific objectives, or e) developing provisions for granting variances from compliance with water quality objectives. Use of biological information can help to more precisely define potential aquatic life uses and may eventually be used to develop biological criteria, which in turn can be used to guide water quality management decisions.

Any modification to beneficial uses or development of water quality objectives or adoption of variances can only be accomplished through the Basin Plan amendment process. Because of the number of water bodies where action is needed, alternative policies and actions may need to be considered. Funding from stakeholders and the NPDES program is allowing some work to proceed for EDWs. Similar funding is not available for agricultural dominated water bodies. Work is in progress that is expected to result in a template for beneficial use studies and resulting beneficial use amendments. Even with a template, evaluation of water bodies, not covered with the allocated resources, will require staff resources of 0.5 PYs for three years to oversee studies and to conduct a basin plan amendment and contract funds estimated at \$500,000 per beneficial use evaluation and water quality objective development.

### Drinking Water Issue

The Sacramento/San Joaquin River Delta is the source of drinking water for two thirds of the state’s population (over 20 million people). Due to increased intensity of development and coincident population growth, the demand for high quality drinking water is increasing. However, the two principal rivers discharging to the Delta, the Sacramento and San Joaquin Rivers, receive pollutants from the various land uses in the Central Valley including, agriculture, mining, confined animal facilities, and urban runoff. These pollutants include pesticides, trace elements, metals, nutrients, and pathogens.

In response to directives in the 1996 Reauthorization of the federal Safe Drinking Water Act, the USEPA has been developing more stringent regulations with respect to controlling and reducing levels of disinfection by-products (DBPs), total organic carbon (TOC) and pathogens. USEPA is

expected to release additional rules that will require more surface water treatment and control of contaminants in source waters.

These new drinking water regulations identify constituents of concern that have not been part of the waste discharge arena. In addition, the role of some of these constituents in the environment is not fully understood and so these constituents are difficult to regulate. The CALFED Record of Decision obligates the Regional Board, with support from the CALFED agencies and the Department of Health Services (DHS), to develop and adopt a policy for sources of drinking water by the end of 2004. This policy is to include identification and implementation of appropriate pollutant source control measures, focused regulatory and/or incentive programs targeting pollutants of concern, and development of a monitoring and assessment program. Particular interest has been expressed by the stakeholders for development of a water quality objective for total organic carbon (TOC).

Stakeholders have provided staff resources of 0.5 PYs per year and are seeking funding to conduct the necessary studies.

### Water Quality Assessment

Every two years, the State, in accordance with Section 305(b) of the Clean Water Act, is required to submit to the USEPA a report on the status of water quality in the State. The report must include an assessment of water quality conditions in all surface water bodies in the State. As part of this report, the State is required to update the Section 303(d) list of impaired water bodies. The 303(d) list consists of water bodies that are not expected to meet water quality standards even if point sources are regulated to comply with the current level of treatment of technology required by law. For these water bodies, the State is required to establish a time schedule for developing load reductions that will result in the water body being in compliance with standards.

The Regional Board does not have adequate funding for regionwide assessments. Recently, some funds were provided through the Surface Water Ambient Monitoring Program (SWAMP) but not enough to provide a meaningful assessment. Regional Board staff relies on outside agencies and stakeholders to provide assessment information to develop the 303(d) list. The State Board approves the 303(d) list at a public hearing.

Preparing the assessment report and 303(d) list requires staff time to evaluate information and monitoring data, prepare agenda items, answer public comments, and to meet with interested parties to receive public input on list development. Staff participates in a statewide workgroup that works together to develop a consistent statewide program for identifying and listing impaired water bodies. Approximately 2 PYs are being used to complete this task.

## Regional Programs

### Total Maximum Daily Loads

The Total Maximum Daily Load (TMDL) program serves as the Regional Boards focal point for addressing the Central Valley's most difficult, long-term surface water quality problems. As part of the TMDL program, the Regional Board conducts a thorough analysis of existing data and policies and then works through a public process to establish a comprehensive regulatory framework for solving the pollution problem. In addition to required TMDL elements, this framework often includes new numeric water quality objectives, implementation policies, compliance schedules, and monitoring requirements.

A more robust regulatory framework, which goes beyond merely establishing the TMDL, is often required to provide clear goals, expectations, and timeframes that are otherwise not identified in the Region's Basin Plans. While remaining focused on attaining water quality objectives, the framework for solving different water quality problems is flexible with respect to expected time frame for achieving compliance and method of compliance.

TMDL planning activities are closely coordinated with the Board's regulatory programs (e.g. NPDES, irrigated lands waiver) to ensure compatibility with those programs and feasibility of implementation. This coordination has resulted in additional data being collected for TMDL development; early implementation activities to take place; and streamlined TMDL adoption.<sup>1</sup> As part of TMDL planning, the Regional Board also strives to maximize its collaboration with stakeholder groups, while carrying out its mandated duties to establish TMDLs and protect water quality.

In the Central Valley, there are 103 water quality limited segments on the 2002 Federal Clean Water Act Section 303(d) list with 255 waterbody /pollutant pairs (some water quality limited segments are impaired by more than one pollutant). As of October 2004, the Regional Board had established TMDLs for 15 of those waterbody / pollutant pairs; established TMDLs for 5 waterbody / pollutant pairs no longer listed; and was working on nine TMDL projects to address an additional 42 waterbody / pollutant pairs.

The initial focus of the Region's TMDL efforts has been on those water quality problems that are large scale and have the greatest potential impact on beneficial uses. The pollution problems being addressed include mercury in the Sacramento watershed and Delta; currently registered pesticides throughout the Central Valley; and agricultural related pollutants in the San Joaquin watershed. The challenges associated with these efforts go beyond those associated with establishing the TMDL. Issues that are being considered as part of the TMDL effort include: water rights; how to clean up abandoned mines; pollutant trading; and resolving sometimes incompatible mandates in environmental laws (e.g. FIFRA<sup>2</sup> vs. Clean Water Act and Porter-Cologne).

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<sup>1</sup> TMDL program staff worked with MS4 permit staff, so an MS4 permit could serve as the basis for a TMDL. The Board was able to adopt the TMDL by resolution rather than going through a lengthy Basin Planning process.

<sup>2</sup> Federal Insecticide, Fungicide, and Rodenticide Act

To carry out its TMDL program, the Regional Board has 18 PY that are supported by TMDL, CALFED, and Non Point Source funds. The Regional Board also competes annually for contract funds to support its TMDL data collection and analysis efforts. In addition to TMDL development, the staff and contract resources are used to oversee and track implementation for four recently completed TMDL projects.

### Grant Project Priorities

Many water quality improvements are beyond the jurisdiction of the Regional Board. In many cases, stakeholders are best suited to provide stewardship efforts to protect and enhance the water quality of local streams. The Regional Board supports these efforts by providing technical assistance and directing grant funding to these groups. A list of the regional priorities for these projects is Appendix 1. Priority projects should result in measurable improvements in water quality and contribute to ongoing implementation at a reasonable expense.

### Monitoring and Assessment

The Regional Board is responsible for protecting beneficial uses of water in the Central Valley Region. Comprehensive monitoring and assessment programs are critical for evaluating whether beneficial uses are being protected and for evaluating the success or failure of control programs. Over the years, the Regional Board and other agencies have focused their limited resources on the mainstem rivers and water bodies that have the most obvious impairments. Because of this emphasis, data is available for the Delta, the lower Sacramento River, the lower San Joaquin River and a few other water bodies that are located near significant pollutant sources (i.e., Iron Mountain Mine and Penn Mine). However, there have never been enough resources to fully assess the conditions in these water bodies. Many small tributaries to the mainstem rivers, streams upstream from the major reservoirs, and most of the lakes have received little attention. Comprehensive assessments have never been made for ground water quality. However, limited monitoring has identified significant ground water quality problems in all three watersheds that will require extensive work to determine what types of actions can be implemented to correct these problems. In all three watersheds, there are inadequate resources to address the monitoring and assessment needs. Activities must be prioritized, while at the same time allowing development of plans to eventually address all the needs in the watersheds.

The primary focus of the Regional Board's monitoring efforts is to: 1) follow-up on water quality problems that have previously been identified and use the data to support 303(d) listing recommendations; and 2) initiate programs to assess water bodies that have not previously been comprehensively evaluated. A wide variety of agencies and stakeholders are involved in monitoring and assessment activities. An integral part of the Regional Board monitoring strategy is to cooperate with these other stakeholders in implementing monitoring and assessment programs. One of the Regional Board's goals is to develop monitoring and assessment programs and priorities using a consensus approach involving stakeholders within a watershed.

Because each watershed has both a unique set of stakeholders and unique water quality concerns that must be addressed, the management process and the accompanying monitoring program are somewhat watershed specific. A common element in all three watersheds is that monitoring

programs are designed primarily to address nonpoint source problems, since the most significant water quality problems in the Region result from nonpoint sources (see Clean Water Act Section 303d List and Water Quality Assessment) and the point sources are being monitored under the permit programs.

A regionwide need is the bioassessment and habitat evaluation of effluent and agriculturally dominated water bodies throughout the Central Valley. This effort is being coordinated with the USGS and DPR in order to identify appropriate water bodies to evaluate within each hydrologic regime of the basin and to maximize use of the resulting data.

Historically, resources to monitor nonpoint source and other beneficial use impacts have been limited. Recent funding through both the TMDL program and through the Surface Water Ambient Monitoring Program (SWAMP) has allowed increased effort focused on developing a comprehensive monitoring program. The TMDL monitoring focus is to identify sources of loads of contaminants known to impair water quality in specific water bodies and to evaluate the success of control efforts implemented to reduce those loads. The SWAMP monitoring has two major components: first, to direct sampling to suspected water quality impairments and provide defensible listing and delisting of 303(d) water bodies; and second, to provide general statewide information on water quality in California.

A review of the monitoring requirements for surface and groundwater programs (Appendix 3), with estimated staff and contract resources, shows an annual need of 61.5 PYs and \$19,275,000 in contract funds. There are four specific areas of significant need for monitoring resources. These are: selenium monitoring on the San Joaquin River, which was cut from the budget in 1993 during the budget shortfall; an integrated dormant spray program in cooperation with DPR; a comprehensive toxicity and TIE monitoring program on the San Joaquin River and its major tributaries; and loading of methyl mercury to the Delta from upstream sources. The Region's monitoring and assessment programs are described in the State of the Watershed Reports and in Appendix 3.

### Nonpoint Source Program

Nonpoint source pollution is the leading cause of water quality impairment in California. California's Nonpoint Source (NPS) Pollution Control Program has been in effect since 1988. In 2000 the lead State agencies for the NPS Program, the SWRCB and CCC in coordination with the RWQCBs, released the "Plan for California's Nonpoint Source Pollution Control Program" (NPS Program Plan). The NPS Program Plan enhances the State's efforts to protect water quality, and to conform to the Clean Water Act Section 319 (CWA 319) and Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). The State's long-term goal is to "improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013." A key element of the Program is development and implementation of five-year plans that cover State Fiscal Years 1998-2003, 2003-2008, and 2008 -2013.

The California Nonpoint Source Program encompasses more programs than the activities funded through the federal nonpoint source program resources. Appendix 2 describes the Regional

Board's activities and needs under each of the NPS Program management measures. In addition, a description of activities and needs for abandoned mines is also included in Appendix 2.

### Basin Planning

The Basin Plan is the framework that implements state and federal water quality control laws and regulations within each regional board. There are two Basin Plans that cover the Central Valley Region. One Plan covers the Tulare Lake Basin and the other one covers the Sacramento River and San Joaquin River watersheds, including the Delta. The Basin Plans include a listing of beneficial uses of waters in the Region, water quality objectives to protect these uses and a program of implementation needed to achieve the objectives and protect the beneficial uses. It is the intent of the Regional Board to maintain the Basin Plans in an updated and readily available edition that reflects the current water quality control program. However, with only 0.6 PYs available for basin planning activities each year, many planning issues remain outstanding. Staff basin planning activities is generally limited to conducting the triennial review. The Triennial Review process divides basin planning issues into high, medium and low priority with the amount of resources that are estimated to be needed to complete each issue. A detailed description of all issues from the last triennial review may be found in the two staff reports available from our website at:

[http://www.swrcb.ca.gov/rwqcb5/available\\_documents](http://www.swrcb.ca.gov/rwqcb5/available_documents)

Other than triennial reviews, basin planning resources are used to train staff and other interested parties and ensure consistency in basin plan amendments, which are typically funded through other programs and by stakeholders.

### Water Quality Certification Program

The State and Regional Boards protect water quality from dredge and fill activities (including dredging, placement of fill in waterways, streambank erosion control projects, installation of pilings, placement of pipes, etc.) in waterways and wetlands through issuance of Water Quality Certifications in accordance with Section 401 of the federal Clean Water Act (CWA). Water Quality Certifications are issued as part of the US Army Corps of Engineers (USCOE) permitting process under Section 404 CWA, and deal with potential surface water quality problems outside of the NPDES Program (which is under Section 402 CWA). Water Quality Certification is the method used by the Regional Boards to implement the Governor's Executive Order that there be no net loss of wetlands within the State.

Certification cannot be issued without compliance with the California Environmental Quality Act; the Regional Board becomes lead agency for some of these projects and must prepare, circulate, and adopt environmental documents for the projects. Currently, 1.8 PYs per year are allocated to this program. Based on statewide estimates developed by the Coordinating Committee, an annual augmentation of about 25.0 PYs is required to fully conduct this program in the Central Valley.

### Storm Water Regulatory Program

The major components of the storm water regulatory program are municipal and industrial. The municipal program involves urbanized areas of 100,000 or more population and requires the municipalities to identify and characterize storm water discharges, and to develop programs to remove pollutants in the runoff to the maximum extent practicable. There are seven municipal permits which need updating every five years: one is in the Sacramento River Watershed, one is in the San Joaquin River Watershed, three are in the Delta Subwatershed, and two are in the Tulare Lake Watershed. There are also four individual permits, one regionwide, two in the Sacramento River Watershed and one in the Delta Sub-watershed. The industrial program consists of two general permits that cover general industrial and construction activities. The region has about 1500 industrial (633 in the San Joaquin River Watershed, 325 in the Delta Sub-watershed and 495 in the Tulare Lake Watershed) and 1400 construction sites (335 in the San Joaquin River Watershed, 20 in the Delta Sub-watershed and 232 in the Tulare Lake Watershed) which submitted Notices of Intent, which brings the facilities into the storm water program. Only a small fraction of the sites (about 60 industrial and 60 construction) are inspected annually. Some of the industrial facilities have waste discharges that are regulated under other programs such as Chapter 15 and Confined Animals. In those cases, storm water inspections are conducted in conjunction with inspections under those other programs. However, additional staff resources are still needed to conduct field inspections and follow-up enforcement, as needed. An ideal schedule would have all construction sites inspected at least annually, since they are short-term projects, and industrial sites inspected every few years. Industrial facilities are required to submit Annual Reports summarizing their compliance with the general storm water permit. The reports are currently logged in, but undergo minimal review.

There are an unknown number of construction and industrial activities that have not filed required Notices of Intent to comply with the General Storm Water Permits. The SWRCB through contracts is conducting a non-filer search, but the follow-up on the results of the searches is up to the Regional Boards. Current staffing does not allow sufficient time to follow-up on all of the SWRCB non-filer search data, or on other information on non-filers that the Board receives.

Complaints are periodically received concerning storm water runoff from industrial and construction sites. Current staffing does not allow investigation of all complaints. Currently, 11.6 PYs per year are allocated to this program. Based on statewide estimates developed by the Urban Runoff Taskforce, an annual augmentation of about 30.0 PYs is required for this program.

### NPDES Program

The Regional Board regulates discharges of wastes to surface waters with NPDES permits to protect the quality and beneficial uses of those waters. There are 318 regulated NPDES facilities in the Region: 69 major and 249 minor. Of these, 167 (35 major and 132 minor) are within the Sacramento River watershed, 78 (19 major and 59 minor) are within the San Joaquin River watershed, 24 (9 major and 15 minor) are within the Delta sub-watershed, and 49 (6 major and 43 minor) are within the Tulare Lake Basin watershed. At the current base resource level, it is

not possible to complete all of the new, revised, and renewed permit actions on schedule. Additional staff resources of 2.0 PYs are needed to develop permits in a timely manner.

Based on the SWRCB Administrative Procedures Manual (APM) minimum levels of inspections for NPDES facilities, over 700 inspections are required annually in the Region. With existing staff, slightly fewer than 200 inspections of NPDES facilities are conducted annually. Smaller NPDES dischargers may only be inspected once every five years. Inspections are often not as thorough as desired and sampling is not conducted due to lack of staff time. Estimated staff time to comply with the APM and complete 500 additional inspections at 20 Hrs / inspection = 10,000 hours, or 5.8 PYs.

### Waste Discharge Requirements Program

The Regional Board regulates through waste discharge requirements (WDRs) over 1335 facilities (excluding dairies and other confined animal facilities, which are discussed separately) that discharge to land in a manner that allows infiltration into soil and percolation to groundwater. Of these facilities, over 500 facilities are in the Sacramento River watershed; 432 facilities are in the San Joaquin River Watershed, 87 facilities are in the Delta Sub-watershed, and 535 facilities are in the Tulare Lake Watershed. The Board also indirectly regulates many other facilities that discharge waste to land through conditional waivers of WDRs. These facilities all have the potential to create nuisance conditions and to degrade groundwater. For this reason, both regulated and waived discharges fall under the Board's waste discharge requirement (formerly the 'Non15', now 'WDR') program. To ensure that water quality is protected, the program consists of issuing WDRs for new facilities, updating and revising existing WDRs, conducting announced and unannounced compliance inspections, responding to complaints, reviewing self monitoring reports (SMRs), technical reports and taking various levels of enforcement action and responding to appeals of Board actions.

To regulate facilities, the WDR program employs both individual and general (region-specific and statewide) WDRs. The Board imposes conditions of discharge intended to assure that wastewater treatment and management is consistent with the goals of the Board, and with the goals of the State Legislature when it created the regional water quality control boards. The dischargers are required to implement best practicable treatment and control where the Board allows groundwater limits that exceed background water quality.

Normal conditions of discharge include regular monitoring and reporting of effluent quality, application rates, soil vadose zone, and groundwater. The surveillance element consists primarily of spot inspections and Board staff review of self-monitoring reports (SMRs). As necessary, enforcement is initiated in accordance with a *State Water Resources Control Board Water Quality Enforcement Policy* (Enforcement Policy).

Based on the performance goals described in the State Board's *Administrative Procedures Manual for Water Quality (APM)* and subsequent policies (e.g., Enforcement Policy), the resources needed to properly administer the WDR program in the Central Valley were estimated to be 116 PYs (excluding needed dairy resources). The past funding deficiencies have created a backlog of unmet updates, inspections and self-monitoring report reviews; undiscovered

violations; delayed enforcement; and unauthorized and unaddressed water quality degradation. The accumulated backlog of overdue updates is by far the largest of all the regional boards (as is the total number of facilities). The problem is worst in the Tulare Lake Watershed. Assumptions in this chapter are that program funding will remain at about the current level and continue to be the main impediment that precludes the Board from fulfilling all of its program responsibilities.

Conditions of discharge thus far have relied on generalized water quality limitations and treatment and control expectations, which based on reviews funded in FY 1999/2000, have not been effective in controlling groundwater degradation and potential nuisance. The Board staff is reviewing the approach for program modifications that will ultimately implement more specific conditions and improve program consistency and discharger accountability. Many dischargers of industrial food processing land treatment operations are expected to self-manage and self-monitor their wastes. An unacceptable number have been found to not be following minimum guidelines (BMPs) for the industry, to be creating nuisance conditions, and to be degrading groundwater. Efforts to correct problems at a number of sites have resulted in a critique on the validity of the premise on which the BMPs have been based. Both the wine industry and food processing industry in general initiated further study into waste management practices. Similarly, municipal and domestic dischargers have been found to be deviating from good operation and management, and several have degraded groundwater quality.

These situations have resulted in the need for increased technical scrutiny to determine whether waste treatment and control measures employed by dischargers satisfy the best practicable treatment and control standard mandated by the Antidegradation Policy. Further, and more importantly, increased monitoring and technical evaluation of potential impacts on groundwater is necessary to assure that degradation does not exceed what has been determined allowable in accordance with the Antidegradation Policy.

**Biosolids:** The Region receives municipal sludge generated in the San Francisco Bay, Central Coast, and Los Angeles basin areas, as well as municipal sludge generated within the Central Valley itself. The State Board adopted statewide general WDRs and an EIR in FY 2000/01. Some counties have sought delegation of the biosolids program, and many have prohibited or are considering prohibiting all, or all but exceptional quality, biosolids application on agricultural property.

**Wastewater Effluent Reuse:** Most wastewater treatment plants in the Central Valley use some form of land disposal. This use represents a significant loading to the groundwater in the Valley because most are operated as disposal sites rather than reuse areas. All of these should be evaluated to determine the potential for increased efficiency to reduce impacts to groundwater. In addition, these should be evaluated for potential use in wetland development. This effort would build upon the previous study on potential wetland development in response to AB 4328 completed November 1991.

With the current program staffing, the Board has been able to process up to 20, 9, and 29 updates annually in the Sacramento, San Joaquin and Tulare watersheds, respectively, under the current priorities and resource distribution. The Board will enter this planning period with a backlog of

35, 88, and 150 WDRs overdue for updates in each watershed, respectively. Given the same amount and distribution of resources, same processing rate, and those WDRs that come due for update within the planning period, by the end of FY 2005/06 the backlog will increase to 115 and 159 for the Sacramento and San Joaquin watersheds, respectively. The backlog in the Tulare watershed should be reduced to 87 in this period. Board staff will work cooperatively with industry to define BMPs and to improve discharger accountability for prevention of nuisance and providing groundwater of the highest water quality reasonable.

The APM calls for nearly 3000 inspections annually. Due to resource constraints, the Board has never been able to perform this level of surveillance.

Absent a significant field presence, self-monitoring reports (SMRs) are the primary means of determining a discharger's status of compliance with WDRs. The Board is expected to obtain 100% of reports due and perform a Level 1 review of all of them. Contracted student assistants that work part-time perform most reviews, and this has inherent problems of timeliness, continuity, quality control, and training. Groundwater monitoring data is substantially more complex, and of increasingly greater importance, and dependent upon permanent and experienced staff to evaluate results. The Board intends to be fair, firm and consistent in taking enforcement actions in this program while recognizing the individual facts of each case, and to initiate enforcement 'as soon as possible' after discovery of the violation. Enforcement priorities shall consider the following significant violations: chronic violations; violations of prohibitions; spills; failure to submit reports (SMRs and technical reports); violations of compliance schedules; failure to implement a pretreatment program; violation of water quality objectives or groundwater limitations; failure to pay fees, penalties or liabilities; and falsifying information.

The Board will continue to support small communities in obtaining grant funds, and to support all communities in obtaining loans for needed improvements. See Appendix 1 for additional information regarding these grants.

### Title 27/Chapter 15

Staff is working on about 100 Chapter 15 sites in the Sacramento River Watershed, 56 sites in the San Joaquin River Watershed, 20 sites in the Delta Sub-watershed, and 165 sites in the Tulare Lake Watershed. This includes landfills, aerial applicators, industrial surface impoundments, land treatment facilities, compost facilities, active mining operations, and certain abandoned mines. The program includes issuing permits for new facilities, revising existing permits, reviewing technical documents submitted for WDR compliance, conducting inspections, taking enforcement actions, responding to appeals and addressing complaints. It is anticipated that roughly the same or a slightly higher level of funding will be available in the next few years. Resources are adequate to complete scheduled workplan commitments, but staff work on unanticipated enforcement, appeals, and citizen's complaints may hamper completion of those commitments.

### Department of Defense (DoD)

In the DoD program, Board staff oversee the investigation and cleanup of sites with soil and groundwater pollution at active, closed, and former Department of Defense sites. By their nature, most Department of Defense sites are, or were, self-contained “cities” with their own water supply and waste treatment plants, with populations in the tens of thousands of workers and residents. In addition, these facilities often perform functions typical of industrial centers, such as equipment repair, maintenance, and fabrication. These sites are polluted by numerous contaminants, including petroleum, volatile organic compounds, pesticides, inorganic constituents, etc. Much of the pollution is due to past waste disposal and handling practices, as well as spills and leaks. Many of these sites threaten nearby water supply wells, including private domestic, agricultural, and municipal supply wells, often in areas increasingly dependent on groundwater. In addition to the concerns listed above, closed or closing military facilities have the added dimension of re-use. Re-use of closed facilities is in the best interest of the military, the State, and the local community. Often there is pressure on the military to accelerate cleanups at these sites so that the infrastructure and the property can be transferred to new owners to allow economic development to occur. The respective DoD branches are required to investigate and remediate the pollution, and pay the Board staff’s oversight costs through a reimbursement fund set up through a Memorandum of Agreement with the State. Funding for this program is expected to decrease over the long-term, as several large facilities undergo the closure process and are finally cleaned up. Short-term resource needs are anticipated to remain the same for the next several years, however.

Staff is working on 17 sites in the Sacramento River Watershed (6 of which are large sites), 11 sites in the San Joaquin River Watershed (5 of which are major sites), one in the Delta Sub-watershed, and two in the Tulare Lake Watershed (both of which are large sites). There are not enough resources to adequately cover all of the sites.

Funding for these facilities is expected to decrease over the next several years as investigative phases are completed, remedial systems are installed, and the sites enter into long-term operation and maintenance phases for the treatment systems. Regional Board oversight will still be required during these long-term cleanup phases to ensure systems are achieving the cleanups agreed to with the military.

#### *Spills, Leaks, Investigations and Cleanups/ Department of Energy (SLIC/DOE)*

In the Spills, Leaks, Investigations and Cleanups program (including Department of Energy facilities) program, Board staff oversees the investigation and cleanup of sites with soil and groundwater pollution by numerous contaminants, including petroleum, volatile organic compounds, pesticides, inorganic constituents, etc. Much of the pollution is due to past waste disposal and handling practices, as well as spills and leaks. Many of these sites threaten nearby water supply wells, and new sites are discovered as a result of property transactions or nearby environmental investigations. Responsible parties are required to investigate and remediate the pollution, and to pay the Board staff’s oversight costs.

As part of the SLIC program, staff works on approximately 92 sites in the Sacramento River Watershed, 67 in the San Joaquin River Watershed, 27 in the Delta Sub-watershed, and 33 in the

Tulare Lake Watershed. It is anticipated that about 10% more sites will be added in each of the next two years.

As this is a cost recovery program, resources are generally not an issue, except to the extent accounts are delinquent. However, one part of the SLIC program is cleaning up perchloroethylene discharged from dry cleaners and the sewers they used. Generally, dry cleaners do not have the resources to participate in cleanup or cost recovery, so the ground water remains contaminated. In some cases, staff has convinced the sewer owners to do cleanup, but that takes intensive staff work.

### MTBE in Surface and Groundwater

Methyl tertiary butyl ether (MTBE) has been mixed with gasoline in the Central Valley Region since the mid-1970's as a small percentage to as much as 15% in the late 1990's. MTBE is soluble in water at 42,000 mg/L allowing it to move with groundwater. Except for dilution, the compound is very resistant to natural degradation in either surface or groundwater. The California Department of Health Services has designated MTBE as a potential carcinogen with the MCL established at 14 µg/L and the secondary taste and odor threshold, at 5µg/L.

Currently, staff has recorded over 900 sites with MTBE releases with 24 drinking water wells impacted. MTBE also has been shown to cause high mortality to aquatic microorganisms (food for fish). The sources of MTBE include above and underground storage tank systems, pipelines, landfills and wastewater treatment plants.

Due to the overwhelming number of MTBE sites and the physical & chemical complexities of MTBE, adequate resources are not available at this time. Staff resources allow for cursory oversight of high priority MTBE sites. Significant resources are needed to address this issue.

### Underground Storage Tanks

Underground Storage Tanks (USTs) containing hazardous petroleum products have impacted groundwater resources through leaks and spills. Impacts are at scattered sites in the watershed and are typically associated with service stations for fueling motor vehicles. Contaminants include benzene, toluene, ethylene, xylene and MTBE.

Currently, the Central Valley Region has recorded 2598 leaking underground tanks of which 700 are in the Sacramento River Watershed, 1334 are in the San Joaquin River Watershed, 304 are in the Delta Sub-watershed, and 260 are in the Tulare Lake Watershed. Although not fully evaluated, 1498 of the leaking tanks involve a release of MTBE. Of these involving MTBE, 300, 814, 224, and 160 are within the Sacramento River Watershed, San Joaquin River Watershed, Delta Sub-watershed and Tulare Lake Watershed, respectively.

Investigation, remediation and closure at leaking under ground storage tanks are administered under county and Regional Board programs. Under State Board contract, Local Oversight Programs exist in Sacramento, Solano, Napa, Alameda, San Joaquin, Stanislaus, Tulare, and Kern Counties. The remaining counties receive assistance from Regional Board staff in

administering their programs. Emphasis is placed on enforcement of high-risk sites and no further action required when cases become low risk. Inadequate funding precludes working on more sites.

The Board currently diverts one PY to address problems in Glennville, Kern County. Community wells have been seriously impacted by gasoline releases from a local gasoline station. A settlement was reached in 1991 that set aside \$500,000 for cleanup and abatement. A second release in 1997 with MTBE also affected multiple domestic wells. Emergency, Abandoned, and Recalcitrant Account funds were allocated to help fund remediation and provide alternative water to affected residents.

### *Above Ground Tanks*

The Aboveground Tanks Program with staff oversight has been eliminated. Facilities are still required to be in compliance with the Aboveground Petroleum Storage Act (APSA) which requires tank owners to register their tanks and pay a fee, provide secondary containment, and prepare and implement a Spill Prevention, Control and Countermeasure (SPCC) Plan. At sites that have polluted the environment, responsible parties (RPs) are required to investigate and remediate the pollution. Staff oversees these actions under a cost reimbursement program, where the RP pays the Board's oversight costs.

There are 2076 registered AGT facilities in the Region, 792 are in the Sacramento River Watershed, 496 are in the San Joaquin River Watershed, 50 are the in Delta Sub-watershed, and 738 are in the Tulare Lake Watershed. There are 51 sites conducting soil and groundwater investigations and cleanup under cost recovery, 23 are in the Sacramento River Watershed, 19 are in the San Joaquin River Watershed, and 9 are in the Tulare Lake Watershed.

## **SECTION III: STATE OF THE WATERSHED REPORT FOR SACRAMENTO RIVER WATERSHED**

### **Watershed Description**

The Sacramento River drains the northern part of the Central Valley. The Sacramento River's Basin covers 27,210 square miles. For planning purposes, this includes all watersheds tributary to the Sacramento River that are north of the Cosumnes River watershed, including the closed basin of Goose Lake, the drainage sub-basins of Cache and Putah Creeks and the Yolo and Sutter Bypasses.

The principal streams are the Sacramento River and its larger tributaries: the Pit, Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stony, Cache, and Putah Creeks to the west. Major reservoirs and lakes include Shasta, Oroville, and Folsom, Clear Lake, and Lake Berryessa. The remaining inputs (approximately 25% of the flow) come from streams entering from smaller watersheds along the river and from agricultural and storm drain systems (SWRCB 1990). The Sacramento River basin supplies more than 80% of the fresh water flows to the Sacramento-San Joaquin Delta (Montoya *et al.* 1988). There are over 50 sub-basins or tributaries to the Sacramento River.

DWR Bulletin 118-80 identifies 63 groundwater basins in the Sacramento River watershed area. The Sacramento Valley floor is divided into two groundwater basins.

There are separate State of the Watershed Reports for the Pit River, Feather River, Yuba River, Stony Creek and Cache Creek.

### **Water Quality Assessment, Strategies and Activities, and Resource Needs**

#### **SURFACE WATER**

Beneficial uses in the Sacramento River watershed are adversely impacted by the presence of pollutants and sediments entering the watershed from a variety of sources. In 1990, the State Water Resources Control Board released the final project report for the *Sacramento River Toxic Chemical Risk Assessment Project*. In this report, the four major sources of chemical pollutants entering the Sacramento River were identified and characterized. These sources are agricultural drainage, mine drainage (primarily acid mine drainage), urban runoff, and NPDES discharges. Animal production facilities, rangelands and forest activities (including fires) were not included in that assessment, but should be considered to be potential sources of pollution. Since 1987, Regional Board staff has conducted a series of toxicity surveys of various portions of the Sacramento River watershed. Significant toxicity has been detected throughout the watershed. About half of the observed toxicity has been linked to specific pesticides, herbicides, and metals. In addition to these chemical constituents, the watershed is impacted by sedimentation, high temperatures, altered flow and temperature regimes, loss of habitat and introduction of exotic species. High priority issues for the Sacramento River watershed are reducing the loads of organophosphate (OP) pesticides, mercury and other metals, and developing temperature

objectives protective of salmonids. The load reduction studies are partially funded; however, the development of temperature objectives protective of salmonids is unfunded.

### Organophosphate (OP) Pesticides

The Sacramento River and its tributaries have been included in the Clean Water Act 303(d) list as impaired due to elevated levels of diazinon causing toxicity to *Ceriodaphnia*. The source of the diazinon is from orchards and urban areas. There are no water quality objectives for diazinon; however, the Department of Fish and Game has developed criterion. This criterion is routinely exceeded in urban creeks during storm events and in Sacramento and Feather Rivers following storm events during the dormant spray period. A TMDL is in progress to address these issues.

The Regional Board's strategy for agricultural sources of OP pesticides is to allow the local stakeholders an opportunity to identify management measures that will reduce the levels of pesticide runoff to acceptable levels while maintaining agricultural productivity. The Sacramento River Watershed Program, dedicated to working on watershed issues within this area, formed the OP Pesticide Focus Group (Focus Group), a stakeholder group representing a wide variety of interests (including pesticide manufacturers, agricultural groups, regulatory agencies, the City of Sacramento and academia), to address OP pesticide runoff to the Sacramento and Feather Rivers from orchards during the dormant spray season. The Focus Group has developed a strategy that should help with the implementation of the diazinon TMDL for the Sacramento and Feather Rivers. It is hoped that aspects of the strategy will also be applicable to other areas of the Central Valley. Specifically, the strategy will include a menu of management measures with estimates of the effectiveness of the management measure in reducing pesticide loads, identification of data gaps relative to management measure effectiveness in reducing OP pesticide loads, and an education and outreach program to encourage participation from growers and pesticide applicators. Additional benefits may be expected from these practices: some of the application method practices could serve to mitigate other sources of pesticide loading, and many of the on-site practices can be effective in reducing nutrient and sediment loading to the watershed.

Many growers are using alternatives to OP pesticides, specifically, pyrethroids. Unfortunately, pyrethroids, while insoluble in water, are highly toxic to aquatic organisms and can enter water bodies bound to sediment particles. Funding is needed to study this alternative pesticide and identify potential environmental impacts.

*Urban Runoff:* Urban runoff consistently causes acute toxicity to *Ceriodaphnia* in Sacramento area urban creeks and infrequently causes toxicity in both the Sacramento and American Rivers. Toxic conditions can be expected in other urban areas in the watershed. Toxicity to *Ceriodaphnia* has been linked to the insecticides diazinon and chlorpyrifos. Malathion has also been detected at concentrations exceeding the US EPA water quality criterion. A number of Sacramento urban creeks are included on the 303(d) list as impaired due to malathion.

The Urban Pesticide Committee (UPC), with representatives from the Central Valley and San Francisco Regional Boards, municipal storm water agencies, sanitation districts, the Department

of Pesticide Regulation, US EPA, pesticide registrants, pesticide control operators, county agricultural commissioners, and others, was formed by the Central Valley and the San Francisco Regional Board staff to address the issue of OP pesticide toxicity in urban creeks. The Regional Boards' strategy is to use the UPC as a communication point in the many urban creek OP pesticide TMDLs that must be developed in the Central Valley and San Francisco Bay Area. In this capacity, the UPC could be instrumental in communicating the various tasks required in developing these TMDLs.

*NPDES:* Pesticides are included in laboratory screening done once every five years as part of the NPDES renewal process. If pesticides are found at levels of concern, monitoring and effluent limits may be prescribed as is appropriate.

### Organochlorine Pesticides

The Sacramento River has elevated concentrations of organochlorine compounds, including PCBs, DDT and its metabolites DDD and DDE, toxaphene, and chlordane. The pesticides in the Sacramento River are thought to result primarily from past agricultural use since use of chlordane, DDT, and toxaphene has been banned.

The Basin Plan prohibits detectable concentrations of persistent organochlorine pesticides in receiving water. NPDES monitoring for some municipal wastewater facilities is showing the presence of lindane in the effluent. Because these municipal discharges are to effluent dominated water bodies where the receiving water limit is applied to the effluent, the presence of lindane indicates a violation of the basin plan objective.

### Metals

*Mercury:* Mercury in the Sacramento River is generally the result of past mining activities in the Coast Range and the Sierra Nevada Range. There are numerous mercury mines in the Coast range and mercury was used in the Sierra gold mining operations. Several studies have focused on determining mercury load estimates from the Sacramento River watershed. From May through December 1994 (low flow) an estimated 20 kilograms (kg) of mercury entered the Delta from the Sacramento River. From January through April 1995 (high flow) 406 kg of mercury entered the Delta from the Sacramento River. A loading study conducted by Larry Walker and Associates (1997) estimated that 640 kg of mercury were exported by the Sacramento River watershed to the Delta from October 1994 to September 1995. Most of the material was contributed during winter high flow periods. The Feather and American River watersheds accounted for approximately 25 percent of the load; the majority of the mercury appeared to originate from the Sacramento River watershed above the confluence of the Feather River. The bioavailability of these sources of mercury is unknown. Fish tissue studies are needed in Sierra Nevada reservoirs and Coast Range reservoirs where the levels of mercury may warrant consumer advisories.

NPDES permits for surface water dischargers contain concentration and load limits for mercury, monitoring requirements and pollution prevention plans. In addition, major municipal dischargers are required to lower mercury discharges through pretreatment activities.

The Sacramento River Watershed Program formed the Delta Tributaries Mercury Council to address the mercury issues. The goals of the Delta Tributaries Mercury Council are to provide technical assistance in developing site-specific criteria, standards or other targets for mercury, develop conceptual model(s) to describe fate, transport, sources, and processes affecting ambient levels of mercury, help identify and quantify important point and non-point sources of total and methyl mercury, and help implement monitoring to evaluate effectiveness in reducing mercury loads.

*Urban Storm Runoff:* Urban runoff is known to contribute to metal loads in the watershed. Storm water permits include provisions to address the urban runoff contribution of mercury to the impairment of the Sacramento River.

#### Other metals

*Urban Runoff:* Urban runoff is a major source of lead. The Sacramento Stormwater Program estimates an annual load of 5000 pounds of lead is contributed from the Sacramento urban area. Copper, zinc, and nickel in urban runoff have been linked to observed toxicity in urban runoff. Storm water permits include a provision to develop a Storm Water Quality Improvement Program to address storm water pollutants that cause or contribute to exceedances of water quality standards and potential impairment of beneficial uses.

*Acid Mine Drainage:* In the past fifteen years, numerous mine abatement projects have been implemented in the upper Sacramento River watershed. The largest of these projects, Iron Mountain Mine, was listed as a Federal Superfund Site since 1983 and remediation efforts have been underway since 1988. Currently, most of the acid mine drainage from the Iron Mountain Mine site is collected and treated (lime neutralization treatment).

Acid mine discharge control efforts at the Shasta Lake mines have focused on reducing water drainage into the mines and installing concrete bulkhead seals on mine adits. This activity has had partial success and overall, has reduced metal loading to tributary streams to Shasta Lake. The Regional Board adopted additional enforcement orders on the Redding area inactive mines and abatement efforts are continuing.

State and Regional program policy, legislative reform (to address liability issues), and public funding for abatement projects are key elements in the Regional Board's efforts to address the issue of metal discharge from abandoned mines. Staff is working with other stakeholders to understand the metal issues in the watershed.

#### Toxicity

Toxicity to *Ceriodaphnia* and *Selenastrum* has been detected in the Sacramento, Feather and American Rivers. Diuron has been identified as the cause of algal toxicity observed in the Sacramento River, San Joaquin River and the Delta. The majority of diuron applications in 2000 was to right-of-ways and alfalfa crops. Additional algal toxicity has been found but has not been linked to a specific chemical.

In 1997, Regional Board staff conducted a toxicity survey of the Sacramento River watershed using rainbow trout embryos. Significant mortality occurred in urban runoff-dominated creeks during the early portion of the storm season. The cause of this toxicity is unknown. Calfed has provided funds for a study to begin in Spring 2003 with trout embryos to try to determine the cause of the toxicity.

### Sedimentation

Many tributaries in the watershed are adversely impacted by land use practices that cause excessive erosion and sedimentation, change flow regimes, or alter stream morphology. Degradation of upstream watersheds can also impact downstream beneficial uses (i.e., decreasing reservoir life, silting in spawning beds, etc.). Many of the tributary watersheds have active stewardship and conservancy groups, which have identified sedimentation as the major water quality problem in many areas. The sources of the sediment include stream bank erosion, erosion following fires, erosion associated with timber harvest activities, road construction, cattle grazing, and urban construction activities.

The Regional Board strategy to address sedimentation is to assist local watershed groups to develop citizen-based programs to reduce impacts of erosion and stream sedimentation. Goals of these programs include: teaching citizen volunteers to use a variety of assessment tools to collect data about watershed conditions and evaluate effectiveness of outreach efforts; educating stakeholders about land use activities which increase erosion and sedimentation; implementing best management practices to reduce sediment loading and to maintain stream channel integrity; and implementing demonstration restoration projects. Regional Board participation in these projects is funded with limited resources from the nonpoint source program and the Surface Water Ambient Monitoring Program (see “Monitoring and Assessment” in the Regionwide Activities section for more information on this program). However, funding is not adequate for staff to fully participate in all the projects taking place in this watershed.

### Temperature

The major reservoirs in the watershed change the flow regimes in the downstream rivers. One of the consequences is change in downstream temperature.

Elevated temperatures pose a threat to salmon and steelhead, and are a concern in Mill, Deer, Battle, Butte, Antelope, Clear, and Big Chico Creeks. The Department of Fish and Game has recommended that the Basin Plan objectives be amended to protect salmon runs in these streams. Temperature increases are associated with loss of riparian habitat and agricultural and urban runoff.

No resources are available to work on temperature issues except for watershed assistance funded through the nonpoint source program.

### Polychlorinated Biphenyls (PCBs)

Total PCB concentrations are above EPA recommended criteria to protect human health at the confluence of the Sacramento and San Joaquin Rivers in the Delta. In addition, clam transplant studies demonstrated that some of the highest tissue concentrations were obtained from animals located in the Sacramento and San Joaquin Rivers. The data were interpreted to mean that the Rivers were a source of PCBs. Additional monitoring resources are needed to determine the importance of riverine loads and the temporal and spatial extent of exceedances in the Sacramento River, as well as resources to develop guidance on how to design and analyze studies for determining whether or not fish tissue levels of contaminants are elevated.

### Watershed Stewardship Programs

In addition to the Sacramento River Watershed Program, there are numerous local, grass roots efforts that have been initiated to restore watersheds that have been degraded, or are threatened to be degraded by various land use practices. Restoration efforts include stream rehabilitation, changes to existing land use practices, and improved watershed management (i.e., forest management, wildfire fuel reduction). Regional Board staff is currently working with several local watershed groups with overall objectives of improving water quality and aquatic habitat conditions. Staff will continue to assist with monitoring and assessment efforts to identify problems and document watershed problems, seek funding support for grants and attend meetings. In the Sacramento River watershed, staff is working with local groups on Mill Creek (Tehama County), Big Chico Creek (Butte County), Butte Creek (Butte County), Deer Creek (Tehama County), Goose Lake Basin (Modoc County), Clear Creek (Shasta County), Fall River (Shasta County), Stony Creek (Glenn County), the North and Middle Fork American River (Placer County), Putah Creek (Yolo County), Yuba River (Nevada County) Dry Creek (Sacramento and Placer Counties), Auburn Ravine (Placer County), and the Sacramento Urban Creeks Council (Sacramento County).

Several local programs are implementing monitoring programs being conducted by community volunteers. These programs focus on biological and habitat assessments, toxicity testing and evaluation of the impacts of various land use practices. This monitoring provides useful information and increases community awareness for the need for local stewardship. However, these programs are grossly under funded.

The following is a discussion of the NPS problems and issues for specific sub-watersheds (also, separate reports are attached for the Pit River, Feather River, and the Cache Creek sub-watersheds).

### McCloud River Sub-Watershed

The McCloud River originates in the Cascade Range east of Mount Shasta and flows approximately 20 miles to its confluence with Lake Shasta. McCloud Reservoir was constructed in 1965 in the upper portion of the watershed to augment the PG&E McCloud-Pit Hydroelectric Project. The McCloud River remains, for the most part, a pristine watershed. Notwithstanding, there is concern about the possible impacts of McCloud Reservoir on sediment transport, water

temperature and flow regime. Studies are needed to document existing conditions and identify potential problems.

#### Upper Sacramento River Sub-Watershed

This sub-watershed area includes the Sacramento River and tributaries from its headwaters downstream to Lake Shasta (including Lake Siskiyou). Water quality is generally good and no specific problems have been identified. Potential problems are from erosion and sediment discharge from logging, road construction and other land disturbing activities, urban storm water discharge from the Dunsmuir and Mt. Shasta City areas, future spill events from the Sacramento River canyon transportation corridor, municipal waste discharges from unsewered areas, and temperature increases in the lower reach to the River. Studies are needed to document existing water quality conditions and evaluate these potential problems.

#### Lake Shasta Sub-Watershed

This sub-watershed includes Lake Shasta, Keswick Reservoir and tributaries thereto. The principal water quality issue is acid mine drainage from abandoned and inactive copper mines that operated in the early 1900s. Several streams tributary to Shasta and Keswick Reservoirs are severely impacted by continuing discharges of acid mine drainage and are currently on the 303d list for contamination from acid and heavy metals. These include Spring Creek, Squaw Creek, Little Backbone Creek, Horse Creek and Town Creek. Portions of Shasta and Keswick Reservoirs have poor water quality and periodic fish kills where these tributaries enter the lakes. There is some concern with bacteria concentrations from high-density recreational use in Shasta Lake but no specific problems have been identified.

#### Clear Creek. Sub-Watershed

This sub-watershed includes upper Clear Creek (above Whiskeytown Reservoir), Whiskeytown Reservoir, lower Clear Creek (below Whiskeytown) and tributaries thereto.

Willow Creek (tributary to Clear Creek) is on the 303d list due to acid mine drainage from Greenhorn Mine (inactive copper mine). Whiskeytown Reservoir is on the 303(d) list due to past studies that found elevated bacteria concentrations from high density recreational use. There is a general concern with erosion and sediment discharges throughout the watershed, and with storm water runoff from the urban area in the lowermost reach of Clear Creek.

#### Sacramento River (Shasta Dam to Hamilton City)

This portion of the Sacramento River is important for spawning and propagation of salmon, steelhead and a resident trout fishery, provides municipal supply water for Redding and surrounding communities, and is a high use recreational area. Abandoned/inactive mines in the Redding and Shasta Lake area have historically impacted water quality and aquatic life in the Sacramento River and its tributaries. Studies conducted before 1994 showed algal and invertebrate toxicity in the Sacramento River linked to copper and zinc. In recent years (post-1994), remediation efforts at Iron Mountain Mine and other inactive mines have resulted in a substantial reduction in metal loading to the Sacramento River. Sampling conducted since February 1995 suggests that Basin Plan objectives for copper, cadmium, and zinc in the upper Sacramento River have been rarely exceeded. Recent toxicity tests have not detected toxicity

below Keswick Reservoir. Remediation efforts are continuing to address the residual loading of acid mine drainage from these mines.

Other potential problems in this sub-watershed include storm water discharge from the Redding urbanized area, erosion and sediment discharges from land disturbing activities, and high turbidity from water releases through Shasta Dam.

Further downstream there is some indication of elevated mercury concentrations in the River reach below Red Bluff. The extent of mercury loading and the source has not been documented but a likely source would be the high sediment load from the Westside tributaries.

#### North Sacramento River Basin Tributaries

The principal sub-watersheds here include Churn Creek, Stillwater Creek, Cow Creek, Bear Creek, and smaller drainages within the Redding urban area.

While there are no specifically identified water quality and beneficial use problems, potential problems exist from municipal and industrial storm water discharges, from erosion and sediment discharges from construction and other land disturbing activities, and from bacteria contamination of those waters commonly used for contact recreation. These watercourses currently support or have potential to support anadromous fish populations so protection of aquatic habitat is also an important issue.

#### Westside Sacramento River Tributaries

The principal sub-watersheds here include Cottonwood Creek, Reeds Creek, Redbank Creek, Elder Creek and Thomes Creek.

Tributary watersheds on the Westside of the Sacramento River have relatively high erosion and sediment yields resulting from a combination of unstable geology and past and ongoing land use practices, including urbanization, livestock grazing, road construction, gravel mining, agriculture and wildfires. While no specific water quality and beneficial use problems have been identified, it is believed that these high sediment yields and the channel instability conditions are adversely impacting water quality and aquatic habitat throughout most of these watersheds. The overall objective here is to increase water retention capacity to reduce peak flows and increase base flows, increase the quality and diversity of aquatic life and riparian habitat, and reduce total sediment load to the Sacramento River.

#### Eastside Sacramento River Tributaries

The principal sub-watersheds here include Battle Creek, Antelope Creek, Mill Creek, Deer Creek, Big Chico Creek, and upper Butte Creek.

These streams represent some of the State's largest undammed watersheds and provide valuable habitat for anadromous fish particularly spring-run salmon and steelhead. Water quality conditions are generally good, however, there are potential problems with low summer flow, high water temperatures, erosion/sediment discharge, municipal and industrial storm water discharge from the urbanized area of Chico, and geothermal sources of mercury in Mill Creek. Some reaches in the upper portions of these watersheds show evidence of channel instability and

degraded aquatic habitat, principally from past and ongoing livestock grazing practices. Overall, the objective is to protect the existing high quality of these watersheds and implement site-specific projects that reduce erosion/sedimentation and improve aquatic habitat.

#### Upper Feather River Sub-Watershed

This River sub-watershed covers 3,222 square miles from the crest of the Sierra Nevada downstream to Lake Oroville. Past and ongoing land management practices have increased stream channel instability and incisement leading to accelerated erosion/sediment discharge, increased water temperature and other adverse impacts on water quality, fisheries and aquatic habitat. These land management practices include mining, livestock grazing, wildfire, timber harvest, and railroad and highway construction and maintenance.

#### American River Sub-Watershed

This sub-watershed consists of approximately 1,900 square miles on the western slope of the Sierra Nevada Mountains, extending from the spine of the Sierra Nevada westward to the City of Sacramento. The sub-watershed is bordered by the crest of the Sierra Nevada and the Lake Tahoe Basin on the east, the Yuba and Bear River sub-watersheds on the North, the South Fork of the American River sub-watershed on the South, and Folsom Lake on the west. The drainage of this sub-watershed exceeds 1,100,000 acres.

Historical land uses include mining, recreation, grazing, logging, and water diversion. Long term forest health and catastrophic wildland fires are of critical concern as are erosion and sedimentation, habitat quality, habitat disruption and depletion of biodiversity, the intermix of rural homes and resultant economic fire hazards, the need to maintain the area's economic stability, the need to maintain the stability of the sub-watershed, and the critical need for high quality waters throughout the American River sub-watershed to serve multiple and highly varied downstream needs.

The Lower American River is on the 303(d) list due to pesticide and mercury concentrations in fish tissue. Isolated water quality problems are associated with urban runoff and sewage discharges in the foothills. Septic systems are of concern because of their large number in the upper watershed and, due to a lack of resources for monitoring; there is little assurance that they have been maintained.

#### Lower Sacramento and Feather River Sub-Watersheds

Water quality in the Lower Sacramento River is being addressed by several major programs and legislative mandates. Regional Board staff will act as liaison and will coordinate with these programs and the agencies implementing them.

#### *Monitoring and Assessment (Surface Water Ambient Monitoring Program)*

The Sacramento River Watershed Program (SRWP) has an ongoing monitoring program so the strategy in this watershed is to use state monitoring funds to supplement the SRWP efforts. Previous monitoring efforts in the Sacramento River watershed have focused on the Mainstem River and its major tributaries. Future monitoring priorities should concentrate on wadable streams tributary to the Sacramento River, establishing baseline conditions, and determining

indicators that can be tracked as watershed improvement projects are implemented. Staff is working with the Sacramento River Watershed Program to design and implement a monitoring program to assess pollutants throughout the watershed.

## **GROUND WATER**

### Nitrates

There are roughly 300 square miles of ground water in the watershed with elevated levels of nitrates. The primary areas of concern are in the vicinity of Chico, much of Sutter County, and the Antelope area in Tehama County. The Antelope area of Tehama County is part of the City of Red Bluff, but is currently without sewers. The total size of the area is approximately 3 square miles, with a population of about 3,000 residents. The Chico area is comprised of approximately 25 square miles, with an unsewered population of approximately 38,000. Less severe impacts are found in the vicinity of Knights Landing, Arbuckle, Yuba City, and Willows. Many counties in the watershed depend extensively on septic systems for household wastewater treatment. For example, Butte County with a population of slightly over 200,000, relies on septic systems for approximately 150,000 of its citizens. Not only do septic systems contribute to contamination of ground water, but improperly located and designed, constructed or maintained systems, represent a significant threat to surface water. Nitrates are also a major concern at confined animal facilities, either through inadequate liners in storage ponds to contain wastes, or over-application of wastes on cropland, with the resultant leaching of nitrate and salts to groundwater.

### Strategies to Address Nitrates

In order to control nitrates, the Board adopted a septic tank prohibition for the Chico Urban Area to take effect by the end of 1996. The current Regional Board Guidelines for Waste Disposal from Land Developments minimizes, although it does not prevent, development densities that may cause ground water nitrate impacts. These Guidelines need to be updated to prevent problems from occurring. The State Water Board has been required under Section 13291 of the California Water Code to adopt regulations or standards for the permitting and operation of onsite sewage treatment systems by 1 January 2004. The State Water Board has formed advisory groups to help develop these regulations. Regional Water Board staff is participating in the advisory groups.

There are other sources of nitrates in the watershed. Irrigated agriculture and animal confinement facilities contribute nitrate loads to ground water. The Regional Board maintains a baseline dairy regulatory program, which partially addresses this source of nitrates. There is no program to evaluate or address impacts to groundwater from irrigated agricultural activities.

## **STATE OF THE WATERSHED REPORT PIT RIVER SUB-WATERSHED**

### **Watershed Description**

The Pit River watershed extends from the headwaters of the Pit River in the Warner Mountains east of Alturas through portions of Modoc, Lassen, and Shasta Counties to Shasta Lake. The watershed includes all of the tributaries to the Pit River, including the Fall River. The Pit River has been extensively modified by PG&E for hydroelectric power generation. Point source discharges are limited to lumber mills, and treated domestic wastes from Alturas, Bieber, Adin, and Burney. Nonpoint source discharges associated with agriculture, livestock grazing, timber harvest, and hydrologic modification have had a much more significant impact on Pit River water quality and beneficial uses than point sources.

For purposes of this discussion, the Goose Lake watershed basin will be included with the Pit River; however, this basin is actually a separate hydrologic unit. Past land management practices and extended drought conditions in the 1980s and early 90s caused deterioration of water quantity, quality and aquatic habitat leading to the severe decline of the Goose Lake Redband Trout and other native fish species. Though protection/restoration efforts are underway, some streams are still impacted by degraded aquatic habitat, low summer flows, high temperature and channel erosion and incisement.

### **Water Quality Assessment**

Previous monitoring surveys have documented water quality problems including high nutrients and nuisance algae conditions, low dissolved oxygen, high turbidity/suspended sediment and high water temperature. These water quality parameters, and aquatic habitat conditions in the Pit River are influenced by a variety of factors that detract from overall watershed quality. These include some natural factors such as low summer flows, turbidity from fine suspended sediments (volcanic clays) and thermal/chemical contributions from mineralized hot springs. Nonpoint source discharges associated with land management practices include livestock grazing, forestry and agricultural practices, in addition to flow modifications from irrigation and hydroelectric diversions. Previous channel straightening projects have contributed to channel incisement which drains meadows and causes constrained channel reaches in narrow, straight courses where their increased erosive energy caused bank erosion, down cutting and downstream sedimentation.

The Pit River is on the Clean Water Act Section 303(d) list (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of nutrient enrichment, low dissolved oxygen and high temperature.

The Fall River enters the Pit River near the town of Fall River Mills. The Fall River is a unique spring fed river system that flows approximately 14 miles in total length and supports an exceptional wild trout fishery. In recent years it was observed that upper Fall River was being adversely impacted by sediment deposition that had degraded aquatic vegetation, macroinvertebrates and the wild trout fishery. The source of this sediment load is believed to be from a variety of past land management practices and excessive channel erosion, principally in the Bear Cr. watershed which is the only major tributary to Fall River. Fall River has been included on the 303(d) list because of the sedimentation problem.

Numerous other tributaries to the Pit River have some reaches that are impacted by degraded aquatic habitat conditions, excessive channel erosion and incisement, and increased temperature and sediment loading. These conditions are caused by a variety of land management practices, including livestock grazing, road construction, logging, and channel modifications.

### **Current Assessment and Strategy to Address Problems**

Existing water quality and aquatic habitat conditions in the Pit River watershed have evolved over many years of traditional land management practices. One of the difficult tasks will be to determine what level of improvement could be or should be achieved. Staff's priorities for the next fiscal year are to (1) continue to provide technical support to the Central Modoc and Fall River Resource Conservation Districts (RCDs); (2) assist the Central Modoc and Fall River RCDs in applying for grants; (3) attend the RCDs' meetings to discuss Regional Board concerns and possible solutions; and (4) compile a report on existing monitoring programs in the Pit River Watershed, recommend appropriate modifications, and start watershed scale monitoring efforts.

In an effort to initiate improvement in watershed conditions, the Regional Board staff has assisted in the establishment of the Upper Pit River Watershed Enhancement and Protection Project (UPRWEPP). Experience in other watershed efforts has shown the wisdom in starting at the top and working downstream in a watershed enhancement effort. The specific activities and objectives are as follows:

1. Compile inter-agency database referencing existing, watershed-related reports, defining existing monitoring programs and identifying additional monitoring needs.
2. Begin implementation of enhancement efforts such as bank stabilization, fisheries improvement (such as establishing shade and augmenting spawning gravels), and developing and implementing resource management plans for private landowners.
3. Integrate watershed studies, and restoration efforts into the local community education programs. Utilize enhancement projects (such as planting riparian vegetation and improving spawning gravels).

4. Sponsor demonstration projects and a holistic watershed management approach for local ranchers, in order to encourage practices that will enhance and protect the watershed.

The Regional Board will continue its support of the UPRWEPP and efforts to enhance Pit River water quality/aquatic habitat conditions. Specifically, staff's activities will include assistance to UPRWEPP in acquiring grants; program administration; attendance at watershed meetings; and additional water quality monitoring and assessment work to further study existing problems, to evaluate success of improvement projects and to document long term trends in watershed conditions.

### **Budget**

In the Pit River watershed there are few problems with discharges from NPDES facilities, underground and above ground tanks, industrial facilities, Chapter 15 sites, Non-Chapter 15 sites, etc. Less than 1% of the Regional budget allocated to work on these types of problems is allocated to this watershed. Water quality efforts focus on nonpoint source problems. Nonpoint source efforts in the watershed are supported by resources from the nonpoint source program (Task 436), basin planning (Task 401) and forest activities (Task 172). The staff resources allocated to this watershed are as follows.

<u>Personal Services Task</u>	<u>Funding Source</u>	<u>PYs</u>
1. Continue support of the UPRWEPP, the Pit River RCD and Fall River RCD in their efforts to enhance water quality/aquatic habitat conditions	401 436	0.05 0.05
2. Continue routine forest practice review activities	172, 176 & 177	0.1
3. Expand water quality monitoring and assessment to better define conditions	unfunded	

## **STATE OF THE WATERSHED REPORT NORTH FORK/MIDDLE FORK FEATHER RIVER SUB-WATERSHED**

### **Watershed Description**

The North Fork/Middle Fork Feather River watershed above Lake Oroville covers 3,222 square miles. The watershed begins at the crest of the Sierra Nevada Range and drains west into the Sacramento River and the Central Valley of California. Much of the upper Feather River watershed has been affected by 140 years of intensive human use. Mining, grazing, timber harvesting, wildfire, and railroad and road construction have all contributed to watershed degradation, which down cutting and widening of tributary streams, causing erosion/sedimentation, increased water temperature, and other adverse impacts on water quality, fisheries, and aquatic habitat.

### **Water Quality Assessment**

Existing conditions in the watershed are a result of five major historical and current land uses. They are (1) mining, (2) wildfire, (3) livestock grazing, (4) timber harvest, with its associated roads, skid trails and log landings, and (5) railroad and highway construction and maintenance. A recent survey of the North Fork Feather River found that at least 60% of the watershed has been adversely impacted, resulting in decreased soil productivity, degraded water quality, greatly reduced riparian plant and wildlife communities, lowered water tables and frequent damaging flood flows. The watershed was inventoried for water quality problems. Based on this inventory, it is estimated that as much as 50% of all stream channels are in a degraded condition as are the wetlands, meadows, and rangelands. In many areas, disturbance related to human activity has caused an estimated 6 to 12 inches, of top soil loss from meadows and upland areas, and has contributed to the formation of numerous large and small gullies. Annually, 1.1 million tons of sediment is delivered to Rock Creek Dam at the downstream end of the North Fork Feather River watershed, an estimated 80% of this yearly sediment yield is from "accelerated," human caused, erosion in the watershed.

The principal water quality impacts from this degraded watershed condition are increased sedimentation, increased water temperatures from the loss of riparian shade canopy and the progressive widening and shallowing of the stream channels, and loss of the water holding capacity of the watershed (in the extensive meadow systems) due to stream channel incisement.

## **Current Assessment and Strategy to Address Problems**

In 1984, a Coordinated Resource Management Program (CRMP) group was formed to encourage local support for watershed improvement activities.

CRMP membership includes the following:

- \* U.S. Farm Service Agency
- \* California Department of Fish and Game
- \* California Department of Forestry and Fire Protection
- \* California Department of Transportation
- \* California Regional Water Quality Control Board, Central Valley Region
- \* Feather River Resource Conservation District
- \* Pacific Gas and Electric Company
- \* U.S. Department of Agriculture, Forest Service, Plumas National Forest
- \* U.S. Department of Agriculture, Natural Resource Conservation Service
- \* U.S. Fish and Wildlife Service
- \* U.S. Army Corps of Engineers
- \* Plumas County
- \* Plumas Corporation
- \* North Cal-Neva Resource Conservation and Development Area
- \* Plumas Unified School District
- \* State Water Resources Control Board
- \* California Department of Water Resources
- \* Feather River College

Since its formation, the CRMP has completed over 40 watershed restoration projects with over four million dollars (\$4,000,000) contributed by agencies, landowners and private corporations (principally PG&E.) It is the goal of the CRMP to optimize the beneficial uses and to maintain, protect, and improve, where possible, water quality and quantity in the watershed. The CRMP emphasizes education to prevent future water quality degradation and cooperatively designs and assists with funding for water quality improvement projects. The CRMP structure and process were developed to maximize local initiative and local control over resource management issues. In practice, this means developing consensus among all watershed stakeholders to implement innovative watershed restoration techniques on a voluntary basis using a variety of public and private grants.

The Regional Board has been an active participant on the CRMP and has assisted the group in acquiring several State/EPA 205(j) planning and 319(h) nonpoint source implementation grants. Staff has also served on many of the project specific Technical Advisory Committees. The Regional Board's objective is to achieve water quality and beneficial use improvements through support of site specific stream restoration projects,

better land management practices and public education. To date, this approach has been very successful.

The Regional Board priorities for this watershed are to continue its participation on the CRMP and to continue efforts to provide technical and financial assistance to the watershed program. Specifically, this will be in the form of assistance on applications for grants, program administration, attendance at CRMP meetings, field surveys, and support of water quality monitoring.

Recently, the CRMP has received a Clean Water Act Section 319(h) grant to establish a monitoring program in the North Fork and Middle Fork of the Feather River. The purpose of this program is to assess long-term trends in watershed condition and evaluate the effectiveness of the CRMP efforts (i.e., projects, planning, best management practices and education). In addition, Plumas County has received State Board Proposition 204 funds to undertake extensive restoration work in the Indian Creek Watershed and to provide management/coordination support to the CRMP.

Staff oversight of timber harvest activities is another critical component of the Regional Board's watershed program. Staff resources are inadequate.

### **Budget**

In the watershed, there are few problems associated with discharges from NPDES facilities, industrial facilities, underground and above ground tanks, Chapter 15 sites, Non-chapter 15 sites, etc. Less than 1% of the Regional Budget allocated to work on these types of problems is allocated to this watershed. Water quality control efforts focus on nonpoint source problems. Nonpoint source efforts in the watershed are supported by resources from the nonpoint source program (Tasks 436), basin planning (Tasks 401) and forest activities (Tasks 172). Staff resources allocated to this watershed from these tasks are as follows.

<u>Personal Services Task</u>	<u>Funding Source</u>	<u>PYs</u>
1. Continue participation in CRMP and continue efforts to provide technical and financial assistance to the watershed program	401 436	0.05 0.1
2. Continue routine forest activities	172	0.1
3. Review additional high priority timber harvest proposals	unfunded	

## **STATE OF THE WATERSHED REPORT CACHE CREEK SUB-WATERSHED**

### **Watershed Description**

Cache Creek watershed drains 1,150 square miles on the eastern slope of the northern part of the California Coast ranges in Lake, Colusa, and Yolo Counties. The watershed extends from the tributaries of Clear Lake to the Yolo Bypass, 10 miles northwest of Sacramento. There are three main tributaries: the South Fork of Cache Creek including the Clear Lake drainage, the North Fork of Cache Creek including Indian Valley Reservoir and Bear Creek.

### **Water Quality Assessment**

The most significant water quality problems in Clear Lake are nutrients and mercury. Nutrients entering the lake cause nuisance algal blooms. There is a fish consumption advisory recommending limited human consumption of fish from the lake because of elevated levels of mercury in fish. The main source of mercury deposited in lakebed sediments and continuing to enter the lake is the Sulfur Bank Mercury Mine. Lesser amounts of mercury enter via tributary streams from erosion and geothermal activity at natural mercury deposits. Sulfur Bank Mine is a Federal Superfund site.

Downstream of Clear Lake and Indian Valley Reservoir and in the Bear Creek drainage, there are numerous inactive mercury mines that have localized impacts on adjacent waterways and cumulatively contribute to downstream problems. Fish from lower Cache Creek have elevated mercury levels. During periods of high runoff, large loads of mercury come down Cache Creek and enter the Yolo Bypass. Smaller amounts of mercury are also released into the Yolo Bypass during low summer flows. Mercury from the Cache Creek Watershed appears to be a major source of mercury entering the Delta.

Gravel mining operations in Cache Creek, between the foothills and Yolo Bypass, have caused concern to local citizens. They are concerned that the operations will enhance the transport of pollutants to drinking water wells that are adjacent to Cache Creek. They also believe that the operations have reduced infiltration rates. There are erosion problems downstream from gravel extraction operations. Erosion problems are experienced throughout the watershed and have resulted in substantial property damage, including at a Yolo County park, loss of productive farmland, damage to roads and bridges, and increased risk of flooding at private homes. Gravel removal may remobilize mercury previously deposited with sediment.

Gravel mining within the active channel of Cache Creek has been eliminated. Gravel extraction for flood control purposes is still permitted. Mining has been relocated to adjoining terraces and is being monitored. Yolo County reports that no significant water quality problems to Cache Creek have been detected. There is still some concern

expressed by private citizens about potential problems in the off-site pits that are created during mining operations and potential threats to ground water.

Elevated boron levels downstream from the confluence of Bear Creek can impact agricultural production and may inhibit efforts at reestablishing riparian vegetation.

Comprehensive monitoring studies have not been completed in the watershed to determine whether pesticides are a problem in the watershed. Tests conducted by Yolo County during the 1997-98 winter season did not detect any pesticides or herbicides, however, further testing is recommended. There is the potential for pesticide problems in portions of the watershed that are dominated by agricultural activities. Yolo County testing did show high total and fecal coliform levels in the lower watershed.

Cache Creek is on the Clean Water Act Section 303(d) List (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of mercury and toxicity to aquatic organisms. Causes of the aquatic organism toxicity are unknown. Clear Lake is listed because of mercury and nutrients.

### **Current Activities and Strategy to Address Problems**

The following ongoing and proposed activities in the Cache Creek watershed will include a considerable amount of stakeholder involvement. Regional Board staff will be completing technical TMDLs for Clear Lake by June 2001, for Cache Creek by June 2002 and the Delta by June 2003. Stakeholder input will be sought during development of the major TMDL elements (sources, estimation of mass loads, water quality target, and load allocations) and the implementation plans developed for Basin Plan Amendments. Regional Board staff will work primarily with stakeholders in existing local watershed groups. Additional meetings for the general public will be held as necessary. Resources for both Regional Board staff time and for contracts are required to complete the TMDLs.

Mercury monitoring programs are being conducted by the US Fish and Wildlife Service, US Geological Survey, California Department of Fish and Game, Homestake Mining Corporation, UC Davis, Yolo County, Sacramento River Watershed Program and the Regional Water Quality Control Board. Regional Board staff will continue to coordinate its monitoring programs with existing efforts by local, state and federal agencies.

Important components of stakeholder involvement are education and citizens monitoring networks. Staff will work with interested parties in the watershed to develop monitoring programs conducted by local groups and school programs. Such parties include the Cache Creek Stakeholders Group, the Cache Creek Conservancy, the Yolo County Flood Control and Water Conservation District, and the Rumsey Water Users Group. The responsibilities of the Colorado Center for Environmental Management to assist in organizing an active stakeholder based program for addressing water quality problems in the watershed has been assumed by AGEISS.

There are various educational and/or stream rehabilitation efforts underway in the watershed, including programs by Yolo County, the Cache Creek Conservancy, the US Army Corps of Engineers, Project Hawk, the Putah/Cache Bioregion Project, CALFED, and individual land owners. In addition, a Clean Water Act Section 205(j) grant has been approved to begin to address toxicity concerns in the watershed. In FY 97-98, Regional Board staff provided support for these efforts by cooperatively developing informational packets and sponsoring issue-oriented forums. These support efforts will continue for the next few years. Additional staff effort is needed to streamline the existing permit process in order to better facilitate stream restoration efforts.

### Clear Lake

Lake County has formed a Comprehensive Resource Management Program group to address the algal problem. Efforts have focused on reducing the levels of nutrients entering Clear Lake. Various projects have been implemented to reduce sediment loads to the lake, including some supported by EPA and State Board nonpoint source grants. Lake County submitted a State Board Proposition 204 grant to work on a wetlands project on Middle Creek. The Lake County Public Works Department and the Clear Lake Advisory Subcommittee anticipates releasing a final draft version of a Clear Lake Management Plan in December 1999. The Management Plan will present analysis and implementation options for water quality and ecosystem issues, including mercury, algae, aquatic weeds, erosion, wetlands, surface and groundwater quality, MTBE, forestry management and fisheries. Regional Board staff resources are needed to support these and other watershed efforts.

### Cache Creek

Yolo County has implemented a Cache Creek Area Plan to manage riparian resources in the lower watershed, below Capay. The plan focuses on restoring habitat, reducing erosion, maintaining flood capacity, and improving water quality. The County works closely with the Cache Creek Conservancy and both groups have actively participated in the Cache Creek Stakeholders Group. Toxicity and water quality monitoring are being implemented using State Board grant funds. Regional Board staff needs to continue to support this effort and continue to provide oversight on ongoing grants.

One of the goals of the Cache Creek Area Plan is to coordinate local, state, and federal regulation of activities within Cache Creek. Regional, programmatic permits have been obtained by the County from the US Army Corps of Engineers and the Department of Fish and Game for the plan area. Landowners who wish to work within the active channel must obtain a permit from the County, which includes the conditions required under the regional programmatic permits. This has significantly reduced processing time and costs from the applicant, while also providing a unified, interagency approach to riparian resource management. Additional staff resources are needed to work with the County to try to integrate the Regional Board process in a manner that builds upon, and coordinates with, the existing established programmatic approach that is working in the lower Cache Creek area.

The Cache Creek Watershed Stakeholders Group was initiated in October 1996 after the complex mercury problem in Cache Creek was identified as an issue that may best be addressed through a collaborative watershed approach. The Colorado Center for Environmental Management, an independent, non-profit organization created in 1991 to find better solutions to environmental problems, and the Regional Board worked with local stakeholder and other agencies to initiate this stakeholder driven process to address water quality problems in the watershed and coordinate activities. The group has agreed to the mission of “bringing together all interested parties in a collaborative process to enhance watershed resources by creating opportunities for education and implementation”. Issues of interest to the Cache Creek Stakeholders Group have expanded beyond mercury to include gravel mining impacts, invasive species, erosion control, flood protection, riparian restoration and permitting processes. In addition to participating individually, some local landowners are participating in the Stakeholders group through the recently-organized Capay Valley Water Users Association. The Stakeholders Group is considering development of a watershed management plan for Cache Creek, likely for the region between Clear Lake and the town of Rumsey.

The Cache Creek Stakeholders Group has established issue working groups to work on mercury, non-native plant species control programs and upland erosion. The Cache Creek Stakeholders Group established a steering committee to facilitate communication between the work groups and to help guide the activities of the full watershed group. The Stakeholders Group, working with Yolo County, received State Board Proposition 204 funding for stream restoration work in the lower watershed for fiscal year 1999-2000 with an extension for fiscal year 2000-2001. The upland erosion group is exploring options in cooperation with Natural Resources Conservation Service. Activities of the mercury workgroup are described in the next section.

In Fall 1998, Yolo County accepted a 130 acre site on Cache Creek near Woodland for creation of the Cache Creek Nature Preserve. Initial wetlands restoration and trail construction are being funded by a grant from Proposition 204 funds and the State Wildlife Conservation Board. Goals for the Preserve are to provide a variety of riparian habitat types for wildlife and educational opportunities, particularly for children.

### Mercury

Some abatement work has been completed at Sulfur Bank Mine. US EPA continues to evaluate additional cleanup options. A Superfund site Remedial Investigations Report is slated for release in Fall 2000 and will include results of intensive hydrogeologic monitoring of the site. Once the appropriate cleanup option is identified, US EPA will implement it using federal and state resources. Past discharges to the lake have caused elevated levels of mercury in lake sediment. The elevated sediment levels may continue to pose a threat to aquatic resources. US EPA is evaluating options for addressing this problem. Regional Board staff anticipates working closely with the Superfund Program Site Manager during development of the Clear Lake TMDL and Basin Plan Amendment.

Regional Board staff measured mercury concentrations in the Sacramento River in 1994-95 during high flows. Data from Prospect Slough suggested a potentially significant source in the Yolo Bypass. From January through April 1995 (high flow) 375 kilograms of mercury entered the Delta via the Yolo Bypass. Follow-up studies of the major inputs to the Bypass found that Cache Creek was the primary source. Mercury concentrations in Cache Creek ranged between 600 and 2,200 ng/l. The US EPA recommended criteria for mercury is 12 ng/l. High mercury levels were also detected in other Sacramento River discharges upstream of the Feather River. Follow-up monitoring was conducted by the Regional Board in Cache Creek in each subsequent year to confirm the mercury sources detected in the winter of 1994-95 and to begin to pinpoint sources in the watershed. Staff will concentrate on the Cache Creek Watershed first for designing mercury abatement plans. Information gained in Cache Creek Watershed will be used to evaluate the feasibility of doing abatement work in other watersheds that also appear to contribute elevated loads to the Delta.

Mercury concentrations were monitored in the various tributaries of Cache Creek during the 1995-96 wet season and in subsequent years to develop a mercury mass load for the watershed. Once the tributaries contributing the majority of the mercury have been identified, then follow-up work will concentrate on determining the principle sources within each tributary. Staff has completed initial screening of the tributaries and has initiated detailed mercury follow-up studies on the most significant tributary sources. A final staff report was completed in June, 1998. Results suggest that the most significant sources are the North Fork of Cache Creek, Harley Gulch, and Bear Creek. More monitoring will be needed in the next few years to fully characterize the principle sources in each tributary. Follow-up work is needed to evaluate the feasibility of abatement projects.

An underlying assumption is that the mercury in the various tributaries to Cache Creek is bioavailable. US Fish and Wildlife Service and US Geological Survey are conducting studies in the watershed that should help evaluate mercury cycling. The Regional Board has a contract with U.C. Davis to evaluate mercury bioavailability in Cache Creek. Study results match pretty closely with the load studies that have been completed. Much more work will be needed to prioritize what abatement activities are most appropriate. A survey of abandoned mines is needed to determine which sites are potentially suitable for abatement projects.

Slotton et al. (1997a) reported that concentrations of mercury in aquatic indicator organisms increased in a predictable fashion with increasing trophic feeding level. In a separate study, Slotton et al. (1997b) looked at benthic invertebrates in the upper Cache Creek basin to determine local mercury bioavailability. All invertebrate tissue samples with mercury concentrations greater than background were associated with known mercury mines or geothermal hot springs. The highly localized nature of these sites was demonstrated by the lower biotic tissue concentrations in adjacent streams without historic mercury mining activity. Invertebrates collected in the upper mainstem of Cache Creek away from all historic mining activity had tissue concentrations comparable to similar indicator organisms obtained from mainstem Sierra Nevada River gold mining

activity indicating the Coast Range mercury is at least as bioavailable as that in the Sierras. Tissue concentrations in Cache Creek decreased downstream suggesting that much of the large bulk loads of mercury observed by the Regional Board might not be very biologically available in the lower watershed.

The mercury subgroup of the Cache Creek Stakeholders Groups has been very active. Approximately 20-30 attendees include Regional Board staff, other state and federal agency scientists, mercury researchers from UC Davis and other academic institutions and stakeholders. Topics discussed by the mercury workgroup include evaluation of new data, ongoing and upcoming monitoring studies, mercury cycling, potential sources and mitigation options, human health impacts, coordination of state and federal agency research efforts in the watershed and other concerns. In August 1999, the mercury workgroup changed its name to the Sacramento-San Joaquin Delta Tributaries Mercury Council, to reflect its desire to expand its geographic scope to include mercury in the Sacramento and Mokelumne watersheds and the San Francisco Bay-Delta. CALFED recently funded a multi-investigator research program, an "Assessment of Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed". Regional Board staff and many members of the Mercury Council are involved. The Mercury Council will serve as a forum for discussion of data and draft reports. A final report to CALFED is due in December 2001. Significant amounts of technical information needed for the Cache Creek and Delta mercury TMDLs are expected to be generated through the CALFED project.

The Sacramento River Watershed Program (SRWP) has monetary resources and a workplan for addressing mercury issues in the Sacramento River Watershed. Their goal is an interest-based, stakeholder-driven effort to achieve compliance with water quality goals for mercury in the Sacramento River Watershed. The Delta Tributaries Mercury Council has become the primary forum for formulation of SRWP's mercury strategic plan. The SRWP is funding a facilitator for the Mercury Council. Tasks to be completed in the SRWP mercury plan are designed to be similar to elements needed for a mercury TMDL. Regional Board staff will assist in coordinating activities of the CALFED research program, mercury TMDL development and the Sacramento River Watershed Program's mercury efforts. Regional Board staff also provides technical review to the SRWP mercury plan documents.

The Regional Board has goals to develop and implement a mercury control strategy, satisfy requirements for the Clear Lake and Cache Creek TMDLs and ultimately reduce fish mercury tissues concentrations to levels that eliminate the need for fish consumption advisories. Research and data-gathering activities funded by CALFED and the SRWP will likely provide much of the information needed for these goals. Additional, necessary monitoring and analysis activities that have not yet been funded are the following:

*Assessment of Sources and Bioavailability.* For Clear Lake, a hydrogeologic characterization beginning in December 1999 of the Sulphur Bank Mercury Mine site is expected to provide an estimation of mercury entering the lake. Information will be lacking on the amount of mercury moving from historical

lakebed deposits to the water column and bioavailability of mercury from each source. For Cache Creek, Regional Board staff time is required for continuing mercury loading and bioavailability studies. Fish tissue burden studies, also as yet unfunded, are needed to evaluate the public and wildlife risk posed by elevated mercury concentrations in the Cache Creek Watershed.

*Water Quality Target for Mercury.* Regional Board staff will be coordinating with staff from Region 2 on selection of a water quality target for mercury. Staff time is required for evaluating mercury exposure studies of humans and wildlife and preparing a target selection report. The Sacramento River Watershed Program is evaluating targets as part of its mercury strategic plan, but a final target report is scheduled to be released after the Clear Lake TMDL will be completed.

*Mercury Mass Balance in Clear Lake.* A model of mercury mass balance in Clear Lake is needed prior to calculating the amount of load reduction that would meet the water quality target and developing an implementation plan.

*Implementation Plans.* Plans need to be developed to reduce mercury tissue levels in fish in Clear Lake and the Cache Creek Watershed. Plans should include: load reduction goals for mercury from principal sources; management measures to reduce bioavailability; schedule of activities; recommendations for implementation funding; and follow-up monitoring programs.

### Gravel Extraction Activities

Regarding gravel extraction activities in the portion of the watershed between the foothills and Yolo bypass, staff proposes to continue present levels of activity. The Army Corps of Engineers issues permits for operations in the channel. For instream operations, the Department of Fish and Game issues stream alteration permits. The Regional Board comments on both of these. The Regional Board adopts permits on processing facilities. Monitoring is needed to determine the levels of mercury in ground water.

### Erosion

Private landowners have completed several erosion control projects along the creek, some of which were paid for with state and federal emergency funds. Yolo County is planning additional erosion control projects to be constructed later this year. As was discussed in a previous section, Yolo County received grant funds from the State Board through Proposition 204 for implementing erosion control programs in the watershed.

### Pesticides

There is an ongoing nonpoint source project underway in Yolo County to evaluate practices that reduce pesticide discharges to surface waters. There are projects underway in other portions of the Region that are applicable in this watershed. More studies are needed to define the possible existence and/or extent of problems.

### Unknown Toxicity

Previous monitoring has identified toxicity in some samples collected from Cache Creek. More monitoring is needed to define this toxicity and to determine the cause of toxicity. A Clean Water Act Section 205(j) project provided resources for a toxicity monitoring screening program in Cache Creek. The project is now complete. Significant fish and invertebrate toxicity was detected in samples collected from Cache Creek at the Rumsey Bridge. However, in general, few toxic events were detected throughout the Cache Creek watershed.

### Invasive Plant Species

The non-native invasive plant workgroup of the Cache Creek Stakeholders Group has held several educational forums to provide information of various methods of control of invasive species, particularly tamarisk. The Cache Creek Conservancy plans to create a demonstration project at the Cache Creek Nature Preserve to exhibit methods of tamarisk and *Arundo* removal and revegetation with native species.

## **SECTION IV. STATE OF THE WATERSHED REPORT**

### **SAN JOAQUIN RIVER WATERSHED**

#### **Watershed Description**

The San Joaquin River flows northward and drains the portion of the Central Valley south of the Sacramento-San Joaquin Delta and north of the Tulare Lake Basin. The San Joaquin River Basin covers 15,880 square miles and yields an average annual surface runoff of about 1.6 million acre feet. The Basin includes the entire area drained by the San Joaquin River and all watersheds tributary to the river. The principal streams in the basin are the San Joaquin River and its larger tributaries: the Consumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

The lower Basin (below Millerton Reservoir) has had a highly managed hydrology since implementation of the Central Valley Project (CVP) in 1951. Most of the San Joaquin River flow is diverted into the Friant-Kern Canal, leaving the river channel upstream of the Mendota Pool dry except during periods of wet weather flow and major snow melt. Poorer quality (higher salinity) water is imported from the Delta for irrigation along the west side of the river to replace water lost through diversion of the upper San Joaquin River flows. During the irrigation season, the flows in the river between the Mendota Pool and Salt Slough consist largely of groundwater accretions. Salt Slough and Mud Slough are the principal drainage arteries for the Grassland Sub-Watershed and add significantly to the flows and waste loads in the San Joaquin River upstream of its confluence with the Merced River. Discharges from three major river systems, the Merced, Tuolumne, and Stanislaus Rivers, which drain the Sierra Nevada, dominate flow and quality of discharges from the east side of the Lower San Joaquin River Basin. Flows from the west side of the river basin are dominated by agricultural return flows since westside streams receive no snowmelt to maintain their flows and most would go dry during the summer months.

The major land use in the valley floor along the Lower San Joaquin River is agriculture, with over 2.1 million irrigated acres, representing 22% of the irrigated acreage in California. Urban growth on the valley floor is converting historical agricultural lands to urban areas and is leading to increased potential for stormwater and urban impacts to local waterways.

The San Joaquin River Watershed can be broken into smaller units to address specific problems. One such area is the Grassland Watershed, a 370,000-acre area west of the San Joaquin River between the Tulare Lake Basin and the Orestimba Creek alluvial fan. The watershed contains managed wetlands, irrigated agriculture and a 97,000-acre drainage project area, which is the primary source of selenium to the San Joaquin River. Mud Slough (north) and Salt Slough are tributary to the river and serve as the only drainage outlets for the Grassland Watershed. The watershed has been the focus of the Region's subsurface agricultural drainage program since 1985, and considerable staff effort and resources have been directed to the effort of developing a comprehensive monitoring program, insuring stakeholder involvement, and adopting Basin Plan Amendments and Waste Discharge Requirements in order to develop a workable and comprehensive selenium control program.

The San Joaquin River Basin also includes all or part of nine major groundwater basins: Madera Basin, Chowchilla Basin, Merced Basin, Modesto Basin, Eastern San Joaquin County Basin, Tracy Basin, Delta-Mendota Basin, Westside Basin and Sacramento County Basin. Groundwater is also used in some upland areas and in foothill and mountain valleys.

## **Water Quality Assessment, Strategies and Activities, and Resource Needs**

### **SURFACE WATER**

The most significant surface water quality problems in the San Joaquin River watershed are selenium, salt, boron, pesticides, and unknown toxicity. All of these problems result primarily from agricultural activities and are exacerbated by altered flow regimes. In addition, the Regional Board is concerned with storm water runoff, discharges from inactive or abandoned mines, discharges from dairies, discharges from National Pollutant Discharge Elimination System (NPDES) facilities, and elevated temperature caused by water management practices. Most of these concerns are included in the TMDL workplan to address the Clean Water Act Section 303(d) list.

The US Geological Survey, as a part of its National Water-Quality Assessment (NAWQA) Program, recently released a series of reports on results of a five-year study on the quality of water in 20 major drainage basins throughout the Nation, including the San Joaquin and Tulare Basins. The report, *Water Quality in the San Joaquin - Tulare Basins, California, 1992-95*, describes some general conclusions regarding surface water quality in the San Joaquin River basin: (1) nitrate and ammonia generally do not limit beneficial uses in the mainstem of the San Joaquin River, (2) some nitrate and ammonia concentrations exceed U.S. EPA criteria in some of the smaller tributaries, (3) the potential exists for toxicity to aquatic organisms from water-borne pesticides because concentrations of seven pesticides have exceeded aquatic life criteria, and (4) the potential exists for adverse effects on aquatic life from pesticides in bed sediment and aquatic tissue samples. The US Geological Survey results are consistent with Clean Water Act Section 303(d) listings and water quality assessments. The study did not review selenium, boron, and salt in order to avoid duplicating monitoring and evaluation being conducted by other federal, State, and local agencies. An additional issue not reviewed by the US Geological Survey included seasonal depletions of dissolved oxygen in the lower reaches of the San Joaquin River and the impact to downstream water bodies, including the Sacramento-San Joaquin Delta.

The overall goal for this watershed is to implement Regional Board point and nonpoint source programs in a manner that compliments the activities and goals of other stakeholders in order to achieve water quality improvement and promote restoration of water resources. All the activities fall somewhere on the continuous basin planning cycle, which includes monitoring and assessment, problem evaluation, strategy development and implementation. Resources will be targeted in all of these areas, however most existing resources will be focused on (1) continuing existing point source control efforts, (2) addressing significant nonpoint source problems that have already been identified, (3) assessing water quality throughout the basin in order to update current 303(d) listings and prioritize any additional water quality concerns, and (4) involving

local stakeholders in determining priorities and addressing problems. More resources are needed in each of these areas to fully address water quality concerns.

*Continuing existing point source control efforts:* Current funding is being directed at eliminating an existing backlog within the watershed. With rapid urban growth occurring in the Basin, an overall increase in workload is anticipated.

*Addressing significant nonpoint source problems that have already been identified:* Addressing problems in water bodies included on the 303(d) list for the San Joaquin River Basin is a high priority for this region. This list and TMDL time schedule is staff's best estimate of what work will be undertaken over the next five to seven years under specified funding assumptions. An important element of the proposed strategy is to involve local stakeholders in determining priorities and addressing problems.

*Assessing water quality throughout the basin in order to update current 303(d) listings and prioritize any additional water quality concerns:* Past monitoring and assessment efforts have focused limited resources on the main stem of the San Joaquin River, the Grassland Watershed, and a few other water bodies that are located near significant pollutant sources (i.e., Penn Mine). There has never been enough resources to fully assess the conditions in even these water bodies. Many of the tributaries to the main stem river, the streams upstream from major reservoirs, and most of the lakes have received little attention. With resources made available through the Surface Water Ambient Monitoring Program (SWAMP), staff is developing and implementing strategies for completing water quality assessments throughout the watershed. A summary of the efforts is contained in the Monitoring and Assessment portion of this chapter. However, with current statewide budget shortfalls, the SWAMP funding is expected to be reduced in the coming year. In addition, more attention needs to be focused on the significant groundwater problems in the watershed.

*Involving local stakeholders in determining priorities and addressing problems:* An important element of the strategy for this watershed is to involve local stakeholders in determining priorities and addressing problems. Key areas for stakeholder involvement are the triennial Basin Plan review, the annual cycle of nonpoint source grants, and the biennial update of the water quality assessment and Clean Water Act 303(d) list. Agency led stakeholder groups have been formed and are working on selenium, salt and boron and pesticides. There are other local stakeholder groups that are working on problems in tributaries and upstream watersheds, including work conducted in western Stanislaus County to control offsite movement of suspended sediment and associated pesticides. With additional resources provided under various bond measures, staff anticipates expanding efforts to work with local stakeholder groups and promote development of watershed management plans, with implementation of those plans in future years.

The following information relates the water quality assessment, strategy and activities, and resource needs for major water quality concerns identified in the San Joaquin River Basin.

## Selenium

In 1983, high frequencies of waterfowl deaths and deformities were observed in Kesterson National Wildlife Refuge and were attributed to elevated concentrations of selenium in subsurface agricultural drainage that was entering the site. The source of agricultural drainage to Kesterson was lands within the Westlands Water District. The discharge to Kesterson was discontinued by 1985.

A survey of lands adjacent to Westlands Water District showed that agricultural subsurface drainage from a large area in the Grassland Watershed also contained elevated selenium levels. This drainage water was being discharged directly into channels that supplied water to Grassland wetlands and also into the San Joaquin River.

In 1985, the staff of the Central Valley Regional Board began a monitoring program to assess selenium concentrations and loads in the lower San Joaquin River and the Grassland Watershed and also to track progress of a variety of management practices initiated by the agricultural community as outlined below. Results from the monitoring program indicate that although water quality objectives are now being met in the majority of wetland water supply channels and overall selenium loads to the San Joaquin River are decreasing, water quality objectives continue to be exceeded in the main stem of the river upstream of the Merced River inflow and in Mud Slough (north). The San Joaquin River and several tributaries continue to be included on the Clean Water Act 303(d) list for selenium (Table SJR-1).

## Strategy and Activities

Since 1984, staff has been working with irrigation districts in the Grassland Watershed to develop and implement drainage management plans to reduce selenium discharges to the San Joaquin River and waterfowl areas. Practices that are implemented for selenium also address the boron problem. The problem has been fairly well defined through an extensive monitoring program that was initiated in 1985 and continues to date.

In 1987, a technical advisory committee was formed by the State Board to develop a program to control selenium discharges to the San Joaquin River. The committee developed a regulatory program including recommended water quality objectives and an implementation plan. Much of the program was incorporated into the Regional Board's Basin Plan through an amendment adopted in December 1988. The focus of the implementation plan was on drainage volume and pollutant load reductions through adoption of on-farm management practices -- primarily water conservation. An overall 20% reduction in water use per acre occurred. However, implementation of these measures did not fully achieved program goals. Water quality objectives were not being met in the lower reach of the San Joaquin River or in wetland water supply.

A second amendment to the Basin Plan, which became effective in January 1997, includes selenium objectives for the lower San Joaquin River, Mud Slough (north), Salt Slough and wetland water supply channels and a compliance time schedule. The compliance time scheduled emphasized the need to prioritize the water bodies impacted by selenium in the following order:

1<sup>st</sup>) wetland water supply channels and Salt Slough; 2<sup>nd</sup>) San Joaquin River downstream of the Merced River; 3<sup>rd</sup>) Mud Slough (north) and the San Joaquin River upstream of the Merced River. The amendment contains a conditional prohibition of discharge of selenium to wetland water supply channels and also contains total maximum load limits which are to be implemented through waste discharge requirements. The 1997 amendment was consistent with a consensus letter, jointly signed by the US EPA, US Fish and Wildlife Service, US Bureau of Reclamation, and the San Luis-Delta Mendota Water Authority (representing the Grassland Area Farmers under a joint-powers authority). The letter contains recommendations regarding the use of the San Luis Drain to route high selenium drainage water around the Grasslands marshes. The drainage water is now discharged to Mud Slough (north) instead of to Salt Slough and wetland water supply channels.

In July 1998, the Regional Board adopted waste discharge requirements regulating the subsurface agricultural drainage discharge to Mud Slough (north). The Basin Plan amendment and waste discharge requirements are consistent with the requirements and time schedule for TMDL development that was approved by the Regional Board in January 1998.

As part of the selenium control effort, Regional Board staff continues to work closely with all state, federal, and local agencies involved in the project. Staff serves on the multi-agency Data Collection and Reporting Team (DCRT) comprised of representatives from US EPA, US Geological Survey, US Bureau of Reclamation, US Fish and Wildlife Service, California Department of Fish and Game, and Grassland Area Farmers. The DCRT has developed a long-term monitoring plan to document environmental impacts of the project. The multi-agency monitoring effort will continue to document compliance with waste discharge requirements and impacts from the project. Staff also participates on the Technical and Policy Review Team which reviews the general direction of the project and provides recommendations to the Oversight Committee. The Oversight Committee is comprised of top management from the USBR, USEPA, USFWS, DFG, and the Central Valley Regional Board. The current agreement to utilize the San Luis Drain in this project ends in October 2001. Participating agencies are currently developing an EIR/EIS to evaluate the potential continuation of the project. The EIS/EIR was released for public review in December 2000. Options under consideration include continued use of the drain and incremental load reductions to the river. Continuation of the project may require additional staff resources to review and update current waste discharge requirements.

Although improvements have been documented, development of management options for selenium reduction must continue to insure that water quality objectives will be met. CALFED is proposing to fund a project that evaluates bacterial treatment of selenium in the Panoche Drainage area as well as selenium load impacts on the Delta. Formal Total Maximum Daily Loads (TMDLs) and other approaches (such as Real Time Monitoring and the balancing of saline and freshwater flows) will be evaluated to determine the best strategy for achieving compliance with selenium objectives established for Salt Slough, Mud Slough (north), the wetland channels, and the San Joaquin River.

### Salinity and Boron

Since the 1940s, mean annual salt concentrations in the San Joaquin River, near Vernalis have doubled. The increases are primarily due to reservoir development on the east side tributaries and upper watershed for agricultural development; the use of poorer quality, higher salinity, Delta water in lieu of San Joaquin River water on west side agricultural lands; and drainage from upslope saline soils on the west side of the San Joaquin Valley. Industrial and municipal discharges also contribute to the salinity problem. In addition, current wetland management practices are contributing significant seasonal salt loads to the river. As a result of salt contributions from the various point and nonpoint sources, salinity objectives at Vernalis are periodically exceeded. The salinity objectives were established to protect the beneficial use of water for agriculture. The San Joaquin River and several tributaries are included on the Clean Water Act 303(d) list for salt (Table SJR-1).

For many of the same reasons contributing to salinity concerns, boron concentrations in the San Joaquin River frequently exceed water quality objectives adopted for the protection of irrigation water supply. The majority of the exceedances occur during dry years, with dramatic improvements in water quality during wet years.

### Strategy and Activities

As part of the 1994 Triennial Basin Plan approval, the State Board directed the Regional Board to develop a program to reduce salt loads to the San Joaquin River. In June 1997, staff presented to the Regional Board a workplan that included a framework and schedule under which a Basin Plan amendment for the control of salinity (and boron) would be developed. The proposed amendment focused on the lower San Joaquin River, downstream of Mendota Dam to Airport Way Bridge near Vernalis. The workplan described a five phase effort that would culminate in the adoption of salinity objectives and an implementation program. The entire effort is, and will continue to be, closely coordinated with stakeholders and interested parties. Regional Board staff participates on the San Joaquin River Management Program and the San Joaquin Valley Drainage Implementation Program. All phases of this program include monitoring to evaluate sources and the effectiveness of control measures. Funding from CALFED has been approved for implementing a real time monitoring program that will allow for consideration of a wider range of management options. This program meets the requirements for TMDL development and is consistent with the time schedule for TMDL development that is included in the Clean Water Act Section 303(d) list that was approved by the Regional Board in January 1998.

### Pesticides

*Water Column Pesticide Problems:* Chemical and bioassay monitoring demonstrate that pesticides in the San Joaquin River can occur at concentrations that are toxic to sensitive aquatic organisms. Two multi-year studies have been conducted. The first found that a 43 mile reach of the River between the confluence of the Merced and Stanislaus River was found to be toxic about half of the time to the invertebrate component of the US EPA three species test (US EPA, 1989; Foe and Connor, 1991). Toxicity appeared to be caused by pesticides in storm and irrigation tailwater runoff from row and orchard crops. Follow-up testing conducted a year later

found that River toxicity had decreased to about 6 percent of the time (Foe, 1995). In these two studies and subsequent follow-up studies, the insecticides diazinon and chlorpyrifos have been identified as common causes of toxicity. Additional monitoring by the US Geological Survey, Department of Pesticide Regulation, and others have confirmed the widespread occurrence of diazinon, chlorpyrifos and other pesticides in the San Joaquin River and tributaries (Domagalski, et. Al., 1997; Kratzer, 1997; MacCoy, et. Al., 1995 and Ganapathy, et. al., 1997; Deanovic, 1996 and 1998). The most significant sources of chlorpyrifos and diazinon appear to be winter storm runoff from orchard and summer irrigation return flows. Urban runoff has also been documented to be a significant source in the vicinity of Stockton and Modesto. Urban runoff has been identified as a significant source of these two pesticides in the Bay Area and in Sacramento. The San Joaquin River and several tributaries are included on the Clean Water Act 303(d) list for chlorpyrifos and diazinon (Table SJR-1).

No water quality objectives exist for diazinon and chlorpyrifos. US EPA has developed a criterion for chlorpyrifos and a draft criterion for diazinon. The Department of Fish and Game has developed draft hazard assessment criteria for both pesticides. Both pesticides are frequently detected at levels exceeding the criteria.

Other pesticides, such as malathion and diuron, have been identified at levels of concern in monitoring studies conducted in the San Joaquin River watershed. In addition, in many toxic samples, the toxicant has not been identified.

Organophosphorous (OP) pesticides are used to control pests such as weevils, army worms, alfalfa caterpillars and aphids. According to the Department of Pesticide Regulation's 1998 Annual Pesticide Use Report, over 780,000 pounds of OP pesticide active ingredient were applied to alfalfa in 1998. Primary OP pesticides used were chlorpyrifos (282,130 lbs.) and malathion (260,526 lbs.), followed by dimethoate (84,884 lbs.), phosmet (69,864 lbs.) and methamidophos (61,568 lbs.). A host of other OP pesticides were used as well, but in smaller quantities.

Alfalfa is one of the major agricultural commodities in California, with approximately 188,000 acres in the San Joaquin Valley. OP pesticides used on alfalfa have been identified as the cause of toxicity to aquatic species in watersheds throughout the state. The transport mechanism of the OP pesticides from alfalfa fields to surface water is believed to be primarily due to storm and irrigation water runoff. A bioassay study conducted in the San Joaquin Basin in 1991 and 1992 documented chlorpyrifos detections on 190 occasions between March and June of both years, 43 times at toxic concentrations to *Ceriodaphnia* (Foe, 1995). Major uses of chlorpyrifos in March in the Central Valley are on alfalfa and sugarbeets for weevil and worm control. The United States Geological Survey (USGS), as a part of its National Water-Quality Assessment (NAWQA) Program, in 1993 sampled and analyzed for pesticides, along with other parameters, in the San Joaquin Basin. Chlorpyrifos was detected in 64% of all of the samples collected. Sample concentrations ranged from non-detect to 0.26 micrograms per liter. In 1996 and 1997, sampling on Orestimba Creek was conducted as part of a Dow Agrosiences LLC sponsored a study to characterize chlorpyrifos concentration patterns in an agriculturally dominated tributary to the San Joaquin River. Key crops grown in the watershed included alfalfa, walnuts, almonds, and dry beans. Thirteen chlorpyrifos concentration peak occurrences were associated with

specific events determining the most probable transport process – nine were related to spray drift, four to irrigation tailwater. There were approximately 29 occurrences of chlorpyrifos detections where a transport process could not be identified. Concentrations as high as 2.28 micrograms per liter were found in samples.

In addition to *Ceriodaphnia* toxicity from chlorpyrifos, algal toxicity has been observed in surface waters. The herbicide diuron has been identified as one of the causes. Potential sources are alfalfa runoff, urban storm runoff and applications to rights of way. Approximately 222,000 lbs of diuron was applied to alfalfa in the state in 1998, according to DPR's Annual Pesticide Use Reports. Additional causes of algal toxicity are unknown at this time.

*Fish Tissue Problems:* The State Board Toxic Substances Monitoring Program has found elevated levels of Group A Pesticides in fish from the Tuolumne, Merced, and Stanislaus Rivers and the mainstream San Joaquin River. Group A Pesticides include chlordane, toxaphene, endosulfan, and a few other pesticides. The chemicals are thought to result primarily from past agricultural use. Agricultural use of chlordane, DDT, and toxaphene is now banned and endosulfan use is closely regulated and much reduced. However, the materials appear to be tightly bound to sediment and move into the river systems as the sediment moves offsite. National Academy of Sciences (NAS) and US Food and Drug Administration (FDA) criteria are used to evaluate tissue levels of contaminants. The rivers mentioned above are all included on the Clean Water Act 303(d) list for Group A pesticides and/or DDT.

### Strategy and Activities

The Department of Pesticide Regulation (DPR) and the State Board both have statutory responsibilities for protecting water quality from adverse effects of pesticides. A Management Agency Agreement (MAA) signed by these agencies, describes the regulatory framework for pesticides. Actions to address problems associated with any pesticide need to be consistent with section 303(d) and the MAA.

*Chlorpyrifos and Diazinon:* The general actions that are required to resolve water quality problems associated with these two pesticides are the same for this watershed as for the Delta and Sacramento River watersheds. Each action needs to be implemented in a manner that is appropriate to each watershed. Actions include (1) establishment of interim and long term water quality goals, (2) development of management practices that can be implemented to meet the targets, (3) development of cost estimates to implement the practices, (4) completion of studies to determine potential ecological significance of these pesticides in the Delta and tributaries, (5) establishment of mechanisms for assuring implementation of management practices, and (6) implementation of a monitoring program to measure compliance with water quality objectives. The details and general status of each action is described below since many of the actions are presently focused in the San Joaquin watershed. These actions will be implemented in a manner that satisfies the requirements for TMDL development and is consistent with the time schedule included in the 303(d) list adopted by the Regional Board in January 1998. There will need to be a significant effort to work out the details. It will require working with DPR, CALFED, and many local watershed groups and stakeholders to develop and implement this program. Some

information that is being collected by the Sacramento River Watershed Program (SRWP) can be applied to diazinon issues in the San Joaquin Watershed.

For the agricultural pesticide component, there are numerous efforts underway to develop practices that can be implemented to reduce the amount of pesticides entering surface waters. This work will be summarized as part of the SRWP over the next 12 months. DPR is investigating orchard floor management as a means to reduce discharges of dormant sprays into surface waters. Also, at California State University at Fresno, DPR is investigating the effects of microbial augmentation and post application tillage on runoff of dormant sprays. Dow-Elanco and Novartis, the registrants of chlorpyrifos and diazinon, have undertaken a multiyear study in Orestimba Creek in the San Joaquin River basin with the primary objective of identifying specific agricultural use patterns and practices which contribute the bulk of the off-site movement into surface water. The Biologically Integrated Orchard Systems (BIOS) program has received a series of grants from the State and US EPA to implement community-based efforts to implement economically viable, non-conventional, pest management practices. Colusa County Resource Conservation District is leading a runoff management project, funded through a Clean Water Act Section 319 Grant, to identify management practices that reduce runoff from almond orchards and thereby reduce pesticide loads to local creeks. The Glenn County Department of Agriculture is organizing local growers and PCAs to address the use of dormant spray insecticides in the county. The Biologically Integrated Prune Systems program is a community based project that supports implementation of reduced risk pest management strategies in prune orchards. A similar effort is underway for peach orchards. The University of California Statewide Integrated Pest Management Project has a State Board grant to identify alternative orchard management practices to prevent or reduce off-site movement of dormant sprays, provide outreach and education, and initiate monitoring to assess success of new practices. In addition, University of California was awarded a three year, one million dollar grant by CALFED to identify urban and agricultural practices to prevent and reduce off-site movement of diazinon and chlorpyrifos into surface water. The CALFED study will consider both urban and agricultural stormwater runoff and summer irrigation runoff.

For controlling urban sources of pesticides, the Regional Board is implementing the NPDES Storm Water Program. This program is further described under the section heading "Urban Storm Runoff". In addition to this regulatory effort, interested parties in the Bay Area and Central Valley formed an Urban Pesticide Committee to provide a forum for information exchange, coordination and collaboration on the development and implementation of an urban pesticide control strategy. The Committee has developed a strategy that includes a framework of roles and responsibilities that can be taken by various agencies to reduce pesticides from urban sources. CALFED has earmarked resources to develop management approaches that can be implemented to reduce discharges of pesticides from urban areas. Studies are authorized for the Sacramento urban area and in Suisun Bay.

There are studies underway and planned to try to assess the impact of diazinon, chlorpyrifos, and other pesticides on local aquatic communities. The emphasis of these studies will be on the Delta and principal tributaries to the Delta. A study is underway to conduct bioassays with local species exposed to water collected from Suisun Bay. CALFED has supported a study by UC Davis to evaluate contaminant effects on Delta smelt. CALFED has also supported

implementation of a toxicity testing program in the Delta that includes identification of responsible contaminants. In addition, CALFED has proposed to fund studies to evaluate the ecological effects of diazinon and chlorpyrifos and other pesticides on Delta aquatic species. Finally, CALFED has proposed to fund studies by the Department of Fish and Game that are needed to complete draft criteria reports for the two pesticides.

Over the next several years, staff will to work with DPR and other stakeholders to ensure that management practices are developed and implemented to reduce chlorpyrifos and diazinon concentrations in surface waters. In FY 98-99, staff began working with DPR, registrants and other stakeholders to coordinate studies and discuss results. Staff worked with DPR to develop draft cleanup plans for chlorpyrifos and diazinon. Staff continues to work closely with CALFED to evaluate and refine proposals to support efforts to develop management practices to reduce the discharge of pesticides and to study the ecological significance of measured pesticide levels on local aquatic communities. As part of this effort, staff will participate on the Interagency Ecological Program contaminant effects group. In FY00-01, staff will continue to work with DPR and stakeholders to assure that the funded work to develop management practices and to determine ecological significance proceeds. All this work will be completed in a manner that is consistent with time schedules set in the Clean Water Act Section 303(d) list. There are not enough resources to assure completion of the TMDL work on these pesticides. Resources from a federal Clean Water Act grant (Section 104/106) are being used to initiate activities.

*Other pesticides:* Additional work is needed in the San Joaquin Basin to ensure that all the primary chemicals causing toxicity are identified. Previous toxicity studies have identified other pesticides as causing toxicity and there are many instances where toxicity exists and the toxicant has not been identified. Staff will coordinate these efforts with DPR and stakeholders.

Alfalfa is suspected to be a significant source of chlorpyrifos and diuron in surface water. Presently, studies focused specifically on contributions of chlorpyrifos from alfalfa field runoff have been located in Yolo County (see the State of the Watershed Report for the Sacramento River Watershed). Initial results from the Dow Agrosiences LLC sponsored study in Orestimba Creek in the San Joaquin River Watershed were inconclusive, and did not measure concentrations in runoff directly from alfalfa fields. Additional work is being conducted in the Orestimba Creek watershed during FY00-01. More study is needed to characterize pesticide loadings to the San Joaquin River Watershed from alfalfa, and to develop and assess appropriate mitigation measures for the region.

Basin wide monitoring for organo-phosphate, carbamate, and organo-chlorine pesticides, as well as toxicity is being initiated in FY00-01. The monitoring is being coordinated with efforts by other agencies and will be conducted in the main stem of the river and in major tributaries on a monthly basis, with increased monitoring during storm events. Details of the program are discussed in the monitoring section of this chapter.

*Pesticides in fish tissue:* Most of the listings on the Clean Water Act Section 303(d) list for elevated fish tissue levels of pesticides are based on data collected prior to 1985. Some of the listings are based on relatively few samples. Staff, in cooperation with DPR and the Department of Fish and Game, needs to develop a study plan that could be implemented to determine

whether the listings are still appropriate. Previous studies have suggested that most of the organochlorine pesticide loads reaching the San Joaquin River result from erosion of soils from agricultural lands in the watershed. Practices that are implemented to reduce erosion from agricultural lands should reduce the levels of these pesticides reaching the San Joaquin River.

Since the mid-1970s, the Regional Board has contracted with local Resource Conservation Districts, the Natural Resources Conservation Service, and University of California, to evaluate and document BMPs to reduce sedimentation from the Westside of the valley to the San Joaquin River and costs associated with the practices. In 1987, the USGS identified Westside sediment discharges as the primary source of organo-chlorine pesticides to the San Joaquin River (USGS, 1987). In 1991, western Stanislaus County was designated as a federal Hydrologic Unit Area, and \$500,000 per year was made available for the NRCS and UC Cooperative Extension to conduct public outreach, education, and promote the use of BMPs to reduce sediment loss from agricultural fields. As of 1996, 24% of the 134,000 acre HUA had been treated with structural and managerial BMPs to reduce off-site sediment movement as a direct result of the HUA program. Combined with acreage previously treated with structural BMPs from prior assistance, approximately 66% of the HUA has implemented sedimentation BMPs. However, the goal of 300 mg/L sediment in discharge has not yet been met. Funding for the project ended in 1998 with a final report to be released during FY 99/00. Staff at the Regional Board has worked with the various groups implementing the HUA and will continue to be involved with the local stakeholders.

Monitoring for total suspended solids in the main stem of the San Joaquin River was incorporated into the weekly sampling program associated with the Grassland Bypass Project in October 1998. Additional sites were added in FY00-01 and annual sediment surveys for OC-pesticides and toxicity will commence in Spring of 2001. Information from the monitoring will be released annually beginning Spring 2001.

### Temperature

There are concerns about elevated temperature in the Stanislaus, Tuolumne, and Merced Rivers downstream from the major dams. The storage and diversion of water for hydroelectric and other purposes impacts downstream beneficial uses.

### Strategy and Activities

The Regional Board currently has limited work underway to address temperature concerns in this watershed. The Regional Board needs to work with the Department of Fish and Game and stakeholders to develop amendments to the existing Basin Plan for temperature in the Stanislaus, Tuolumne, and Merced Rivers to protect migration and spawning of cold water species including anadromous species listed on the rare and endangered lists. It is anticipated that during FY 00/01 and FY01/02, staff will begin initial temperature assessments in the upper reaches of watersheds draining to the lower San Joaquin River. Since resources are limited, the assessments will be scheduled to one subwatershed per year. Staff will also initiate stakeholder outreach in the upper watersheds with limited resources from Proposition 13 funding.

### Polychlorinated Biphenyls (PCBs)

The San Francisco Regional Monitoring Program demonstrated in 1993 and 1994 that total PCB concentrations were above US EPA recommended criteria to protect human health at all sites surveyed in San Francisco Bay, including at the confluence of the Sacramento and San Joaquin Rivers in the Delta. Furthermore, clam transplant studies demonstrated that some of the highest tissue concentrations were obtained from animals located in the Sacramento and San Joaquin Rivers. The data was interpreted to mean that the Rivers were a source of PCBs.

### Strategy and Activities

Data from the San Francisco Bay Regional Monitoring program suggested that the San Joaquin River was a significant source of PCBs to the Delta. Follow-up studies are needed to confirm these study results, then source identification and control strategies need to be developed to reduce discharges. No resources have been allocated for this work.

### Metals

With the finalization of the California Toxic Rule by USEPA, many water bodies in the lower San Joaquin River Basin may not meet water quality criteria for trace elements. Limited assessments have been conducted to date as part of the agricultural drainage program on the lower San Joaquin River. The focus on the assessment was on total copper, chromium, lead, nickel and zinc, which all typically fell below levels of concern given the existing hardness of the water. However, other potential trace elements of concern, such as arsenic, cadmium, and mercury, have not yet been evaluated throughout the watershed.

There are localized water quality problems associated with inactive mines. The most significant site and the one staff has and will continue to spend the most resources on is Penn Mine. The Regional Board has been working on Penn Mine for more than 20 years. The Mokelumne River is on the Clean Water Act Section 303(d) list for copper, zinc, hydrogen sulfide and low dissolved oxygen. The site has been under litigation and there are detailed reports on file that describe all the activities that have taken place over the years.

Several additional inactive mines in the Sierra Nevada also drain to the San Joaquin River Basin, however, no resources have been available to evaluate potential water quality concerns at these sites.

### Strategy and Activities

*Penn Mine:* As previously mentioned, the Mokelumne River, downstream from Penn Mine, is a water quality limited segment due to elevated copper, zinc, hydrogen sulfide and low dissolved oxygen. Historically, the first rainfall event of each year resulted in annual fish kills when uncontrolled mine discharges entered the river during low stream flow conditions. Various abatement strategies have been implemented over the past twenty years to reduce the impacts of discharges from the site. Storage/holding ponds to mitigate acid rock drainage were constructed in the 1970s to contain the first few rainfall events. Beginning in the early 1990s, acid rock

drainage contained in these ponds were chemically treated to remove copper and other metals prior to release to the river. With operation of the treatment facility, 98% of all metals were removed from the discharge, increasing downstream protection of beneficial uses. However, the treatment system was not effective in removing hydrogen sulfide and treatment costs were high. The Regional Board and East Bay Municipal Utilities District jointly implemented a \$10 million site restoration project which removed all associated mining wastes in the Penn Mine drainages that formulates acid rock drainage, encapsulated the 400,000 cubic yards of wastes in an on-site landfill and restored the Penn Mine site through soil amendments, topsoil additions and revegetation to simulate pre-mining conditions. Construction activities began April 1998 and were completed in November 1999. Effectiveness monitoring will be performed and additional stream restoration by the US Corps of Engineers will be implemented to enhance the site restoration. A public advisory committee has been formed and supports the proposed project.

Potential impacts from other abandoned mines draining to the San Joaquin River Basin, will not be conducted without increased internal resources or external grants.

## **GROUND WATER**

As was previously discussed the US Geological Survey has recently released a series of reports on results of a five year study on the quality of water in 20 major drainage basins throughout the Nation, including the San Joaquin and Tulare Basins. The report, Water Quality in the San Joaquin - Tulare Basins, California, 1992-95, describes one general finding regarding ground water quality in the San Joaquin Basin: drinking water sources from ground water have been degraded by fertilizers and pesticides.

### *Salinity and Nitrates*

More than 1000 square miles of ground water are impacted by elevated levels of salinity. Areas affected include the entire valley trough between Fresno and Modesto, the vicinity of Stockton, the southern Delta and the entire area on the west side of the valley between Mendota and Los Banos. The sources of salinity include irrigated agriculture, dairies, and other industrial and municipal discharges, as well as areas with naturally high salt concentrations, such as the grassland basin. The problems have been exacerbated by water management practices in the watershed.

There are nearly 200 square miles of ground water in the watershed with elevated nitrate levels. Shallow ground water west of the San Joaquin River in Merced and Stanislaus County has elevated nitrate levels, which affect the cities of Firebaugh, Newman, Gustine, Los Banos and Dos Palos. Also, water supplies are impacted over a wide area extending along the Highway 99 corridor between Fresno and Stockton and across the southern Delta to Brentwood. The principle sources of nitrates in the watershed are believed to be from crop production and dairies.

### Strategy and Activities

There is no organized effort to address salinity and nitrates in ground water in the San Joaquin River watershed. A ground water study is underway at selected dairies to evaluate the effectiveness of current waste system design and operation to protect ground water quality. Work is needed to determine the relative contribution from irrigated agriculture. A program is needed to address the problem.

### Pesticides

More than 500 square miles of ground water are affected by elevated levels of pesticides, mostly Dibromochloropropane (DBCP). Most of the problems occur over a wide area extending along the Highway 99 corridor between Stockton and Fresno. The sources are past applications of DBCP, a product that is no longer in use. The sources of other pesticides in ground water are believed to be primarily from routine agricultural uses of the pesticides.

### Selenium

More than 200 square miles of ground water are affected by elevated levels of selenium. The main area affected is between Mendota and Los Banos, on the west side of the valley. The source of selenium is natural. Agricultural practices cause the selenium to be discharged to surface waters.

### Monitoring and Assessment

The framework for water quality monitoring in the San Joaquin River Basin was developed in 1985, to characterize and control selenium, boron and salt discharges. The program evolved into weekly monitoring of over 25 sites for EC, boron and selenium with maintenance of three automated Sigma samplers. The program was expanded monthly and quarterly to incorporate additional sites and constituents in order to provide baseline information on the lower San Joaquin River, facilitate Real Time and TMDL modeling efforts, and to evaluate ongoing agricultural drainage control efforts as well as the current WDR on the San Luis Drain. Portions of the monitoring program were incorporated into a multi-agency effort under the oversight of the USBR when the Grassland Bypass Project came on line in September 1996. Primary responsibility of the Regional Board under the multi-agency program is collection of water quality information. Coordination of the multi-agency activities occurs through monthly meetings of the Data Collection and Reporting Team (on which staff participates) and release of monthly and quarterly data reports and an annual report which provides evaluation of the overall project for the preceding water year (from 1 October through 30 September). Staff also prepares annual water quality reports specific to both the Grassland Watershed and the Lower San Joaquin River which incorporate data beyond that collected as part of the Grassland Bypass Project. A summary of the multi agency monitoring effort is described in Table SJR-2.

To maintain the integrity of the monitoring activities, specific QA/QC procedures have been developed. These procedures include precise sample preparation, collection, and processing activities, as well as, development of check samples (blanks, splits, spikes) to determine

precision and accuracy of laboratory analyses--both in-house and by contract laboratories. All activities are governed by an internal Quality Assurance Project Plan (QAPP) that is updated annually.

The established multi-agency water quality monitoring in the basin has focused on salt, boron and selenium impacts from agricultural discharges. Maintaining the existing program and expanding it to facilitate real-time monitoring activities are priorities in the basin. Other issues of concern include: aquatic toxicity from water born pesticides; aquatic life impacts from pesticides in bed sediment; habitat impacts from sedimentation; elevated nutrient and BOD levels; pathogens; elevated temperatures; impacts from abandoned mines, timber harvesting and grazing; and establishing baseline condition in coast range streams in areas slated for future development. Table SJR-3 lists the projects within the basin by priority and provides a summary of anticipated costs and projections of funded vs. unfunded activities. Specific details for each project and associated costs are described in Table 2 in Appendix 3. A general description of each project follows.

*Salt/Boron/Selenium Program:* This project would allow continued participation in the multi-agency monitoring effort to evaluate the effectiveness and environmental impacts of the Grassland Bypass Project on selenium, salt and boron concentrations within the Grassland Watershed and the Lower San Joaquin River.

*Expansion for Real Time Monitoring:* This project allows expanded monitoring of assorted inflows to the Lower San Joaquin River (including an increase in the number of sites as well as the frequency of analyses), in order to facilitate the use of a “Real Time Model” to balance discharges of fresh and saline inflows to meet salt and boron water quality objectives at the boundary of the Sacramento-San Joaquin Delta.

*Main Stem of the San Joaquin River:* The San Joaquin River serves as the drainage channel for the entire 16,000 square mile basin and discharges into the Sacramento-San Joaquin Delta. Eight sites, each one downstream of a major inflow to the lower river, will be monitored weekly, monthly, or quarterly (depending on the constituent) to determine overall water quality and potential source of the constituent. In addition to selenium, salt, and boron, evaluations will be conducted for general minerals, trace elements, nutrients, pesticides, total suspended solids, total organic carbon, and water column and sediment toxicity.

*Drainage Basin Inflows to the lower San Joaquin River:* In 1993, five distinct drainage basins were identified that discharged into the lower San Joaquin River. Each drainage basin is bounded by either the Sierra Nevada or Coast Range and is comprised of like land uses and drainage patterns. All natural and constructed water bodies have been identified in each basin as well as potential water quality concerns and major representative discharges to the lower river. This project allows multi-constituent monitoring to be conducted in these representative discharges from each basin on monthly basis and twice a month during the irrigation season (February through August). The monitoring will allow an evaluation of the potential water quality concerns within the drainage basins as well as the relative impacts from the basins on the lower river.

*Storm Events:* The lower San Joaquin River has a highly managed hydrology with flow patterns and water quality primarily impacted by water year type (wet, normal, dry), storm events, and irrigation return flows. Frequency of standardized monitoring has been developed to emphasize predictable irrigation patterns. This project will focus on intensive monitoring of 15 key sites distributed throughout the basin during two major storm events (greater than two inches of rain in a 72-hour period). Monitoring at 10-sites will be conducted every six to twelve hours depending on accessibility, while continuous samplers will be distributed to five sites in order to determine changing concentrations over time and flow patterns.

*Baseline Conditions for Future Urban Creek:* Land use patterns in the basin are changing as traditionally rural areas are developing into an urban corridor between Fresno and Stockton, and demand continues to increase for housing in the Bay Area. A completely new city of 55,000 is slated for development over the next three years. The development will completely surround Mountain House Creek, which currently receives drainage from agricultural and pasture lands. This project will develop a record of baseline conditions to aid evaluation of urban impacts on existing water bodies.

*Algal Bloom in Hidden Reservoir:* Excessive algal blooms have been observed in Hidden Reservoir (a.k.a. Hensley Lake). The Fresno River Watershed has been identified as the contributor of nutrients. SWAMP funds will be used to begin identifying sources of nitrates and phosphorus in the Fresno River Watershed.

*Intensive Rotational Basin Monitoring:* The majority of monitoring efforts in the San Joaquin River Basin are focused on the valley floor and lower river reach. This project will allow a randomized approach to assess overall water quality in each subwatershed that drains into the lower river, including water bodies within the coast range and Sierra Nevada. Approximately 15-sites will be added to existing sites within a subwatershed for a one year period. Additional sites will be evaluated for EC, pH, temperature, turbidity and dissolved oxygen seasonally (at least quarterly). The subwatershed evaluated will be rotated each year.

*Abandoned Mines:* Mercury has been identified as a major contaminant of placer deposits in the Sierra Nevada. In addition, abandoned mercury mines exist in the coast ranges of the San Joaquin River Basin. This project will allow a preliminary review of potential mercury contamination from such sources during each round of the subwatershed evaluation discussed above.

*Grazing and Timber Harvest:* Impacts from grazing and timber harvest have not been evaluated within the San Joaquin River Basin. This project will allow a preliminary review of potential impacts from these activities during each round of the subwatershed evaluation discussed above.

*Pathogens/Bacteria:* All surface water bodies within the basin have potential municipal supply designated as a beneficial use. In addition, the San Joaquin River discharges to the Sacramento-San Joaquin Delta and can impact water supplies delivered to southern California. A major concern with drinking water supplies is contamination by pathogens and bacteria. This project will identify baseline pathogen/bacteria conditions throughout the basin and potential sources. It

is anticipated that this projected will be linked to the main stem and drainage basin projects and expanded into the rotational subwatershed project.

The costs listed in Table SJR-3 assume the use of existing laboratory contracts for the majority of water column analyses and habitat assessment, use of a Master Contract for sediment toxicity testing, and augmentation of an existing student contract for field work and data tracking. The listed costs assume that monitoring programs currently under development by the University of California, US Fish and Wildlife Service, and US Geological Survey will be in place by July 2000. In addition, the first year of cost includes the purchase of approximately \$60,000 of equipment which will be utilized during future monitoring efforts.

During FY00-01, approximately \$548,000 in contract dollars has been allocated to the San Joaquin River Basin for monitoring activities through a combination of funding sources including the Surface Water Ambient Monitoring Program (SWAMP) (\$403,000), general office funds (\$100,000) and CALFED (\$70,000). The allocation has allowed staff to move forward on the first six project priorities identified for the basin (salt/boron/selenium through baseline conditions for future urban creeks) and begin preliminary site investigations for an intensive rotational baseline monitoring of subwatersheds (hydrologic units). Specific monitoring associated directly with the development of TMDLs is included in Tables T1 – T4 in the Regionwide Section.

One of the overall goals of SWAMP is to provide funding to develop a Statewide picture of the status and trends of the quality of California's water resources. It is intended that one portion of SWAMP will be implemented in each hydrologic unit of the State as least one time every five years, as funding allows, in a somewhat statistically random sampling pattern. A second portion of SWAMP will use more directed sampling to develop site-specific information on sites that are known or suspected to have water quality problems. This second portion of SWAMP is focused on collecting information on locations in water bodies the State suspects should be listed or delisted under CWA Section 303(d) as well as to show areas that may exhibit changes due to implementation of best management practices and/or changing land use practices. Although SWAMP has more than double past contract resources available for monitoring in the Basin, the deficit in past resources severely restricted detailed evaluation of known and suspected water quality impairments. Therefore, during FY00-01, all available funding is being utilized for directed sampling activities to better characterize the extent and source of known and suspected water quality impairments. Future augmentations will allow more randomized sampling during hydrologic unit rotations, which can in turn be coordinated with upper basin activities of abandoned mines, grazing, and pathogen source identification.

The contract dollar funding for these efforts is only secure for FY00-01. The SWAMP funding is reallocated annually statewide between Regions, the general office funds may be diverted to fund expanding point source enforcement activities, and the CALFED grant expires at the end of the year. Therefore, Table SJR-3 indicates that monitoring activities in the basin are unfunded after FY00-01.

The previous discussion has applied to contract dollars. A severe shortfall exists in staffing necessary to maintain the program. Staff is needed to establish and maintain analytical and

student contracts; establish and update QAPPs for each project; oversee and participate with students in sample collection, sample processing, data quality review, data entry and verification in data bases; prepare annual report; coordinate with federal, state and local agencies conducting monitoring within the Basin; and disseminate that information to area stakeholders.

Activities specifically slated for FY00-01 include:

- Re-establish 3-year laboratory contract for selenium and molybdenum analyses in saline water
- Augment existing laboratory contracts for:
  - Student interns
  - Nutrients, minerals, trace elements
  - Pesticides in water and sediment
  - Sediment chemistry
  - Bioassays
  - Bioassessment and habitat evaluation
- Develop scope of work for sediment toxicity analyses under Department of Fish and Game Master Contract
- Update QAPP for salt/boron/selenium program
- Create QAPPs for following new monitoring programs
  - Main stem of the San Joaquin River
  - Drainage Basin Inflows to the San Joaquin River
  - Storm Events
  - Baseline conditions for future urban creeks
  - Intensive Rotational Basin Monitoring
- Participate in updating multi-agency monitoring program for the Grassland Bypass Project (GBP)
- Coordinate field work internally and with outside agencies to meet sampling schedule outlined in Table 2, Appendix 3. \_\_\_\_
- Complete reports on the following topics
  - Water Quality chapter for the GBP Annual Report (Water Year 1999)
  - Water Quality within the Grassland Watershed (Water Year 1999)
  - Water Quality in the Lower San Joaquin River (Water Year 1999)
  - Selenium Concentrations in Internal Wetland Water Supply Channels within the Grassland Watershed (Water Year 1999)
  - Total Suspended Sediment Concentrations in the Lower San Joaquin River (Water Year 1999)
- Coordinate with stakeholders and disseminate information
  - Encourage Citizen Monitoring Groups
- Identify potential agency to conduct pathogen/bacteria work (possible development of a Request for Qualifications)

Table SJR-4 indicates available staffing resources and additional resources necessary to adequately address monitoring issues.

**Table SJR-2. Multi-Agency Monitoring for the Grassland Bypass Project.**

Site	Agency	Flow	Temp	pH	EC	TSS	Se	B	3 Spec	Biota	Sed
SLD at inflow	CVRWQCB				WC, W	W	WC	WC			
	SL&DMWA	C			C						
	USBR										S
SLD at terminus	CVRWQCB		W	W	DC, W	W	DC, W	DC, W			
	SL&DMWA								M		
	USBR										S
	USGS	C	C								
Mud Slough upstrm. of SLD	CVRWQCB		W	W	W		W	W			
	SL&DMWA								M		
	USBR										S
	USFWS/DFG									S	
	USGS	Calc.									
Mud Slough downstrm. of SLD	CVRWQCB		W	W	W		W	W			
	SL&DMWA								M		
	USBR										S
	USFWS/DFG									S	
	USGS	C	C		C						
Mud Slough at Hwy 140	USBR										S
	USFWS/DFG									S	
Salt Slough at Hwy 165	CVRWQCB		W	W	W		W	W			
	SL&DMWA								M		
	USBR										S
	USFWS/DFG									S	
	USGS	C	C		C						
SJR at Fremont Ford	CVRWQCB		W	W	W		W	W			
	USFWS/DFG									S	
SJR at Hill's Ferry	USFWS/DFG									S	
Mud Slough at backwater	USBR										A
	USFWS/DFG									S	
Camp 13 Ditch	CVRWQCB				W		W	W			
	SL&DMWA	C									
Agatha Canal	CVRWQCB				W		W	W			
	SL&DMWA	C									
San Luis Canal at splits	CVRWQCB				W		W	W			
	SL&DMWA	C									
Santa Fe Canal at weir	CVRWQCB				W		W	W			
	SL&DMWA	C									
SJR at Crow's Landing	CVRWQCB		W	W	DC, W		DC, W	W			
	USGS	C	C								
Delta Mendota Canal	SL&DMWA								M		

A= Annually, C = Continuously, Calc. = Calculated, DC = Daily composite, M = Monthly, S = Seasonally, W = Weekly, WC = Weekly composite

3 Spec = Three species toxicity monitoring conducted by SL&DMWA. Field measurements (Temp, pH, DO, and EC), selenium, and sulfate analyses are performed on the water used for this test.

Biota = Biological monitoring. This includes selenium concentrations of fish, tadpoles, invertebrates, bird eggs, and vegetation.

**Table SJR-3. Priority Monitoring Projects in the San Joaquin River Basin and Anticipated Costs and Funding.**

Project by Priority	Anticipated Program Cost	Running Total	FY00-01		FY01-02		FY02-03	
			Funded	Non-funded	Funded	Non-funded	Funded	Non-funded
Salt/Boron/Selenium Program	\$145,000	\$145,000	\$145,000	--	--	\$145,000	--	\$145,000
Expansion for Real Time Monitoring	\$100,000	\$245,000	\$100,000	--	--	\$100,000	--	\$100,000
Main Stem of the San Joaquin River	\$60,973	\$305,973	\$60,973	--	--	\$60,973	--	\$60,973
Drainage Basin Inflows to the SJR	\$140,616	\$446,589	\$140,616	--	--	\$140,616	--	\$140,616
Storm Events	\$46,080	\$492,669	\$46,080	--	--	\$46,080	--	\$46,080
Baseline Conditions for Furture Urban Creeks	\$16,009	\$508,678	\$16,009	--	--	\$16,009	--	\$16,009
Algal Blooms in Hidden Reservoir	\$25,000	\$533,678	\$25,000	--	--	\$25,000	--	--
Intensive Rotational Basin Monitoring	\$243,820	\$777,498	\$39,322	\$204,498	--	\$243,820	--	\$204,498
Abandoned Mines	\$11,292	\$788,790	--	\$11,292	--	\$11,292	--	\$11,292
Grazing	\$11,024	\$799,814	--	\$11,024	--	\$11,024	--	\$11,024
Pathogens/Bacteria								
--Baseline	\$50,000	\$849,814	--	\$50,000	--	\$50,000	--	\$50,000
--Source Identification	\$75,000	\$924,814	--	\$75,000	--	\$75,000	--	\$75,000
Totals:			\$573,000	\$351,814	\$0	\$924,814	\$0	\$924,814

**Table SJR-4. Staff Resources Needed for Priority Monitoring Projects in the San Joaquin River Basin.**

Project by Priority	Anticipated Staff Needed	Running Total	FY00-01		FY01-02		FY02-03	
			Funded	Non-funded	Funded	Non-funded	Funded	Non-funded
Salt/Boron/Selenium Program	2.50	2.50						
Expansion for Real Time Monitoring	1.00	3.50						
Main Stem of the San Joaquin River	0.25	3.75						
Drainage Basin Inflows to the SJR	0.25	4.00						
Storm Events	0.10	4.10						
Baseline Conditions for Furture Urban Creeks	0.10	4.20						
Algal Blooms in Hidden Reservoir	0.10	4.30						
Intensive Rotational Basin Monitoring	1.00	5.30						
Abandoned Mines	0.25	5.55						
Grazing	0.25	5.80						
Pathogens/Bacteria		5.80						
--Baseline	0.25	6.05						
--Source Identification	0.25	6.30						
Totals:								

Note: Missing Development of Citizen Monitoring Groups

## **STATE OF THE WATERSHED REPORT DELTA SUB-WATERSHED**

### **Watershed Description**

The legal boundary of the Sacramento-San Joaquin Delta Estuary is defined in Section 12220 of the Water Code (see attached figure). The area comprises over 700 miles of interconnected waterways and encompasses 1153 square miles (State Land Commission, 1991). Most of the Delta is included in the San Joaquin watershed (See watershed description of the State of the Watershed Report for the San Joaquin River Watershed). However, for simplicity, the Delta is discussed here as a separate unit. The Delta, together with San Francisco Bay, is the largest Estuary on the west coast of North America. Three rivers, the Sacramento, the San Joaquin, and the Mokelumne, with a combined average unimpaired flow of about twenty-two million acre-feet per year, feed it. Major beneficial uses of Delta water are municipal and domestic water supply, irrigation water, water contact recreation and freshwater aquatic habitat. First, the Delta is home to over two hundred and eighty species of birds and more than fifty species of fish (San Francisco Estuary Project, 1992; Herbold and Moyle, 1989) making it one of the most ecologically important aquatic habitats in the State. Second, over half of all the drinking water for the State of California is pumped from the Delta (State Lands Commission, 1991). Protecting Delta beneficial uses is one of the Regional Board's major responsibilities.

Water quality impairments in the Delta can result from either contamination being carried into the Estuary on the main rivers or from *in situ* land and water management practices within the system. Reductions in upstream loads should improve water quality conditions in the Delta for many contaminants. Emphasized in this report are activities that must occur within the Delta to ensure the protection of the Estuary's water quality.

### **Water Quality Assessment**

#### **SURFACE WATER**

There are many reports that describe water quality conditions in the Delta. This report is not intended to be a compilation of all these, but instead is presented to summarize what is known about the most important problems. The most significant surface water quality problems in the Delta are mercury, pesticides, salinity, dissolved oxygen, urban storm runoff, polychlorinated biphenyls (PCBs) and dioxins, MTBE, human pathogens and metals. There is concern that sediment may be toxic in some areas and that dredging activities may result in toxic conditions at disposal sites and in the vicinity of the dredging operations.

**Table DELTA-1. Summarized Central Valley Regional Water Quality Control Board Priorities Based on 1998 Clean Water Act Section 303(d) List for the Sacramento River Basin**

Estimated FYs - TMDL Activities (Excluding Basin Plan Amendment)								
Location	Pollutant	Sources	99/00	00/01	01/02	02/03	03/04	>03/04
High Priority								
Delta Waterways	Hg	MINI	[\$]	[\$]	[\$]	[\$]	X	X
	Diazinon, Chlorpyrifos	AGRI, URBA	[\$]	[\$]	[\$]	[\$]	X	X
	DO	MUNI, URBA	[\$]	[\$]	[\$]	[\$]	X	X
Medium Priority								
Delta Waterways	UTX	UNKN	X	X	X	X	X	X
	EC	AGRI	X	X	X	X	X	X
Five Mile Slough	Diazinon	AGRI, URBA	[\$]	[\$]	[\$]	[\$]	X	X
	Chlorpyrifos	URBA	[\$]	[\$]	[\$]	X	X	X
Mosher Slough	Diazinon	AGRI, URBA	[\$]	[\$]	[\$]	[\$]	X	X
	Chlorpyrifos	URBA	[\$]	[\$]	[\$]	X	X	X
Marsh Creek Reservoir	Hg	MINI	X	X	X	X	X	X
Low Priority								
Delta Waterways	Group A, DDT	AGRI	X	X	X	X	X	X
Marsh Creek	Hg, Metals	MINI	X	X	X	X	X	X

**Pollutants**

DO = Dissolved Oxygen

EC = Electrical Conductivity

Hg = Mercury

Group A = One or more of the Group A pesticides\*

UTX = Unknown Toxicity

**Sources**

AGRI = Agriculture

MINI = Resource Extraction (*All MINI sources are abandoned mines*)

MUNI = Municipal Point Sources

UNKN = Unknown Sources

URBA = Urban runoff/Storm Sewer

**Funding Availability**

\$ = funded

[\$] = partially funded

x = not funded

**Funding estimates do not include funds needed for Basin Plan Amendment process. Estimates based upon current workplans.**

The entire Delta is on the Clean Water Act Section 303(d) list (water bodies where objectives are not being met even after application of Best Available Treatment/ Best Control Technology) because of elevated fish tissue levels of mercury, Group A Pesticides and DDT (Table Delta 1). Also, the entire Delta is listed for water column toxicity and chlorpyrifos and diazinon. A small area, in the vicinity of Stockton, is listed because of periodic depressed levels of dissolved oxygen. Stockton urban creeks are listed for chlorpyrifos and diazinon. The southern Delta is listed for salt. Marsh Creek is listed for mercury.

There are numerous agencies, Boards, special committees, and groups that have an interest in the Delta and implement programs that influence water quality. Regional Board staff participates on various committees and work groups that address pollutant related issues. The Regional Board does not intend to try to manage the Delta. Instead, the Board intends to remain focused narrowly on pollutants and pollutant related issues. Staff will coordinate closely with the CALFED Bay-Delta Program and the committees formed to guide implementation of the San Francisco Estuary Project's Comprehensive Conservation and Management Plan (CCMP).

## Mercury

There is a human health advisory in effect in the Delta and in San Francisco Bay because of elevated mercury levels in striped bass and other long lived fish (Office of Environmental Health Hazard Assessment (OEHHA)). The Bay and Delta are both on the Clean Water Act Section 303(d) for mercury in fish tissue. Water column mercury levels in the Sacramento River, in Cache Creek and in parts of the Delta exceed US EPA criteria for total mercury during periods of high storm water runoff. CALFED has identified mercury as a pollutant of concern in the Delta and is evaluating various actions to reduce mercury levels. The main sources of mercury to the Delta are streams tributary to the Sacramento River from both the Sierras and Coast range including Cache Creek (see Sacramento River Initial State of Watershed the Report). Discharges from Mt. Diablo Mine to Marsh Creek are another obvious source.

In California, mercury was historically mined in the Coast Range both north and south of San Francisco Bay and transported across the Valley for use in placer gold mining in the Sierra Nevada Mountains. Both operations caused widespread mercury sediment contamination in the watercourses. The limited mercury work undertaken so far in the Central Valley has concentrated on estimating loads to the Estuary and on determining *in situ* mercury bioavailability in valley waterways.

A loading study conducted by Larry Walker Associates (1997) estimated that the Sacramento watershed to the Estuary between October 1994 and September 1995 exported 640 kg of mercury. Most of the material was contributed during winter high flow periods. The Feather River and American River watersheds, sites of intensive historical placer gold mining activity, accounted for only about 25% of the total load. The majority of mercury appeared to originate from the Sacramento River watershed above the confluence of the Feather River. Between 1993 and 1995 the Regional Board conducted a bulk mercury loading study to the Estuary from the Sacramento River watershed. This study differed from that of Larry Walker Associates in that it included an assessment of loads from the Yolo Bypass during high flows. The Regional Board estimated that the Sacramento River watershed exported 800 kg of mercury to the Estuary between May 1994 and April 1995 (Foe and Croyle, 1998). Staff found, like Larry Walker Associates, that most of the mercury was transported into the Estuary during high flow periods. High mercury concentrations in the Yolo Bypass suggested possible local inputs. Follow-up studies demonstrated that Cache Creek was exporting about 1000 kg of mercury during wet years. Half of the load was trapped in the Cache Creek Settling Basin while the remainder was exported to the Bypass.

Additional monitoring conducted in Cache Creek in 1997 and 1998 confirmed that the watershed was a major source of mercury to the estuary. Sulfur Creek and Harley Gulch were identified as significant mercury sources during the wet season while Clear Lake was the major input in the dry irrigation season. Not yet known is the bioavailability of coastal range mercury once transported into the Estuary. However, Cache Creek serves as the major water source for the recently created Yolo Wildlife Refuge Area. In

addition, the CALFED Bay/Delta Program has purchased several large tidal islands downstream in the Yolo Bypass for conversion to shallow water wildlife habitat. These areas are being built upon fill derived, at least in part, from erosion of the Cache Creek watershed.

Slotton, et. al. (1997) studied mercury bioaccumulation in aquatic invertebrate communities in the Sierra Nevada mountains and Coast Range and identified local hot spots of elevated concentrations of bioavailable mercury. All were associated with past intensive gold and mercury mining. The studies also suggest that some sites with large bulk mercury loads, such as Cache Creek drainage, might not be as vulnerable to methyl mercury production as their loads would suggest at least while in the parent watershed. Still unknown is the fate of the material from the various watersheds once transported into the estuary.

#### Current Activities and Strategies to address the problem

The goal for the Delta is to reduce fish mercury tissue concentrations to levels that eliminate the need for fish consumption advisories. Staff has identified the following general process for addressing beneficial use impairments resulting from elevated mercury levels in Delta fish: 1) form a task force to develop a regional mercury strategy, 2) conduct source identification and assessment studies in the Central Valley and San Francisco Bay area, 3) conduct directed research to better understand mercury cycling in the Central Valley and estuary, 4) conduct pilot mercury control projects and evaluate their effectiveness, and 5) develop a plan to implement a mercury control strategy. These general actions are included in the Regional Board draft cleanup plan for the Bay Protection and Toxic Cleanup Program. These actions need to be implemented in a manner that satisfies the requirements for TMDL development and is consistent with the time schedule included in the Clean Water Act 303(d) list adopted by the Regional Board in January 1998. These actions are also consistent with CALFED's Water Quality Component Report.

CALFED and the Sacramento Watershed Programs have funded much of the recommended early phases of the Cache Creek and Bay-Delta estuary control efforts. A summary of what has and has not been funded is provided below.

*Regional Task Force* A regional task force called the Delta Mercury Tributary Council has been formed and presently meets every other month. The taskforce is composed of mercury scientists, staff from Federal, State and County agencies and local landowners. The Sacramento Watershed Program has funded a facilitator and website. Purpose of the Council is to act as a clearing-house for new local information on mercury and as a sounding board for development of the TMDL.

*Source Identification and Assessment:* This task involves two elements, both of which are at least partially underway in the Central Valley and Estuary. First, continue mercury loading and bioavailability studies and, second, conduct fish tissue burden studies to evaluate the public and wildlife risk posed by the elevated mercury concentrations.

CALFED has funded studies to determine inorganic and methyl mercury loads from the San Joaquin and Mokelumne/Cosumnes basins and to estimate *in situ* methyl mercury production from estuarine sediment. The Sacramento Watershed program has funded a study to better quantify loads from the Sacramento Basin. The loading information will be combined into a mercury mass load model for the estuary. Still needed is information on mercury loading from NPDES and urban storm water runoff in both the Central Valley and Delta. Eventually, the State will also need follow up studies to determine the major sources of total and methyl mercury from the primary watersheds contributing most of the bioavailable mercury to the estuary. However, first needed is a prioritization of the relative mass loads. This will be accomplished by completion of the mercury mass load model.

Preliminary water column and aquatic tissue data from the ongoing CALFED grant indicates that the tributaries, particularly the Sacramento Watershed is a major source of both total and bioavailable mercury for the Delta. The data also indicate that the central Delta is a sink for methyl mercury. While the CALFED study will continue for a second year to confirm these patterns, staff believes the data is sufficiently robust to request funds to begin evaluating sources of methyl mercury in the tributary watersheds. Staff is also requesting funds to organize a study and to determine loads of mercury from major NPDES facilities in the Central Valley and Delta.

CALFED has also funded fish tissue studies for Cache Creek and the Bay-Delta. Both years of collection are now complete and a report is being prepared. In addition, DeltaKeeper and the U.S. Geological Survey collected fish tissue samples this past year. These studies have determined that high levels of mercury are present in fish throughout the San Joaquin Basin and in the Sierras. While we suspected that elevated levels would be seen in the Sierra around gold mining areas, we were surprised by the San Joaquin data. It is clear that the spatial magnitude of the mercury contamination problem is more widespread than originally thought. Therefore, funds are being requested for a valley wide joint fish tissue body burden and human fish consumption study. We believe this information is essential to determine the human risk that mercury poses, develop meaningful TMDL targets and prioritize cleanup in the Central Valley and Bay-Delta Estuary.

*Research:* CALFED has funded directed research to better understand mercury cycling in the Bay and Delta. The emphasis of the research is on evaluating the relative bioavailability of the different sources of mercuric material moving into the estuary in comparison with concentrations already present and available in sediment. At a minimum, these will include an evaluation of inputs from the Coast Range and Sierra Nevada Mountains. The studies should also include an evaluation of the importance of the remobilization of mercury from sediment by natural fluxing. Still to be funded is the development of a model to predict bioavailability of mercury loads from the various sources. This model would be used to make recommendations on the amount of load reduction needed from specific sources to meet the TMDL target. Funds are now being requested for development of a fate, transport and bioaccumulation model.

*Pilot Control Strategies:* Once mercury cycling in the Bay and Delta is better understood and the primary sources of bioavailable mercury known, then pilot control studies should be undertaken to ascertain the most practical, cost effective method of minimizing mercury bioaccumulation. The geographic scope of these will be in both the Central Valley, near the source of the parent material, and also in the estuary where much of this material now resides. For the Central Valley these may include runoff and waste material isolation studies, natural revegetation studies, waste rock removal and infiltration evaluations. Cache Creek has been shown to be a major source of mercury to the Yolo Bypass and estuary. The Cache Creek Settling Basin was built to trap sediment eroding from the upstream basin. Funds are requested to evaluate whether the settling basin can be modified to better trap sediment and the associated mercury. Another Central Valley strategy may be to implement a pilot mercury-recycling program to provide for environmentally safe reuse of mercury collected by Sierra gold dredgers. For the Bay-Delta these will initially emphasize determining the mechanisms responsible for the loss of methyl mercury in the Central Delta. Funds are being requested for a multiyear study to determine mechanism(s) with the hope that these can be enhanced to provide natural mercury control. Funds are also requested to evaluate other Delta mercury control actions in fiscal year 02/03.

Ultimately, it is likely that some of the principal sources of bioavailable mercury in the Central Valley will be determined to be from sites where the owners have insufficient resources to carry out the clean up. The State of California has legislation that limits the liability of third parties that would undertake abatement actions at mines. However, at the federal level, there is no such protection for third parties and this is hampering efforts to clean up some sites. The State of California needs to pursue federal “good Samaritan” legislation.

*Implementation Plan:* The Regional Board committed to U.S. EPA to deliver a technical TMDL for the control of mercury in the estuary by June 2003. The goal of the plan will be to reduce mercury tissue levels in Bay/Delta fish to levels that allow elimination of consumer advisories. The plan should include load reduction goals from the principal sources that contribute to elevated mercury levels in fish and other management measures to reduce fish uptake. Shortly thereafter Regional Board staff will begin preparation of a basin plan amendment for control of mercury in the estuary. The Basin plan amendment will be based upon the technical TMDL but will include a monitoring plan to assess compliance, a time schedule and an implementation plan. Recommendations will also be provided on how to fund implementation

### Pesticides

*Water Column Pesticide Problems:* Aquatic resources in the Delta are in decline (Herbold et al. 1992). Many factors have been advanced to explain the collapse including water diversions, loss of habitat and toxic chemicals. The role of toxic chemicals in this collapse has been the subject of three recent review papers (Bailey et. al., 1995; Fox and Archibald, 1995; Foe, 1995). All three concluded that pesticide concentrations in the

Delta are periodically at concentrations that should be toxic to sensitive local organisms. However, the significance of pesticides on the decrease in abundance and distribution of local organisms is not known.

The Bay Protection Toxic Cleanup Program (BPTCP) began in 1992 to identify locations in the Estuary where contaminant levels in water or sediment were sufficiently elevated to kill aquatic organisms (including bioassays) and where chemicals were identified at concentrations explaining the toxicity. BPTCP funds were used in the Delta to evaluate water column toxicity employing the US EPA three species bioassay procedure (EPA, 1989). Toxicity has been observed to all three species (fish, invertebrate, and alga). However, the chemical responsible for toxicity has only been routinely evaluated for the invertebrate species. This was because limited funds existed and acute toxicity was frequently observed with this species. In each case insecticides (primarily diazinon, chlorpyrifos, and carbofuran) were identified through a combination of chemical analysis and Toxicity Identification Evaluations (TIEs) as the cause of toxicity (Deanovic, et. al., 1996,1998). On some occasions the chemicals were transported into the Estuary on the major rivers and in other cases they were discharged into back sloughs from use within the Delta. An example of a riverine input is the movement of the dormant orchard spray diazinon into the estuary in storm runoff from both the Sacramento and San Joaquin basins (Foe and Sheipline, 1993; Kuivila and Foe, 1995). An example of input within the Delta is the presence in March and April of carbofuran and chlorpyrifos at toxic concentrations in back sloughs from applications to control alfalfa weevils (Foe and Sheipline, 1993; Bailey personal communication). Another example is the toxicity in back sloughs associated with urban runoff from Stockton. A combination of bioassay, chemical and toxicity work has demonstrated that diazinon and chlorpyrifos are present in urban runoff discharged to back sloughs around Stockton at concentrations toxic to sensitive invertebrate species (Connor, 1994, 1995). Toxicity to the algal bioassay organism has also been measured in the Delta and diuron has been implicated as the cause of some of the toxicity. However, in most cases the chemical cause is not known, although Phase I TIEs suggest nonpolar organics (Bailey, personal communication). Finally, fish toxicity has been detected in Sacramento River water at its confluence with the Delta and at various points in the Estuary. The cause of the fish toxicity is not known.

The entire Delta and Stockton area urban creeks are on the Clean Water Act 303(d) list for diazinon and chlorpyrifos. CALFED has identified diazinon, chlorpyrifos, and carbofuran as pollutants of concern in the Delta and is evaluating various actions to reduce levels of these pesticides.

#### Current Activities and Strategies to address the problem

Pesticides have been identified in the BPTCP as a significant source of toxicity to the invertebrate and algal component of the EPA three species bioassay procedure. Carbaryl, diazinon, carbofuran and chlorpyrifos have been identified as the cause of invertebrate toxicity but other chemicals also contribute. Diuron has been implicated as a cause of algal toxicity in a few instances, but in most cases the cause of the impairment is not

known. Finally, several different monitoring groups in Sacramento River water entering the Delta have observed toxicity to the fish component of the tests but the chemical was not identified.

*Chlorpyrifos and Diazinon:* As previously mentioned, the Delta and several tributaries are included on the Clean Water Act 303(d) list for chlorpyrifos and diazinon (see Section 9 in Appendix A for more information). In addition, the Regional Board has adopted a draft cleanup plan for chlorpyrifos and diazinon in the Delta (see Bay Protection and Toxic Cleanup Program description). Actions to address problems associated with chlorpyrifos and diazinon need to be consistent with these two programs and the MAA.

The most significant sources of chlorpyrifos and diazinon are winter storm runoff from orchards, summer irrigation return flows and urban runoff. The general actions that are required to resolve water quality problems associated with these two pesticides include (1) establishment of interim and long term water quality goals, (2) development of management practices that can be implemented to meet the targets, (3) development of cost estimates to implement the practices, (4) completion of studies to determine potential ecological significance of these pesticides in the Delta and tributaries, (5) establishment of mechanisms for assuring implementation of management practices, and (6) implementation of a monitoring program to measure compliance with water quality objectives. The actions need to be implemented in the Delta and the tributaries to the Delta, since a major source of these pesticides is upstream from the Delta. Actions need to be implemented in a manner that takes into consideration the inherent differences in the watersheds. The general actions are included in the Regional Board draft cleanup plans for the Bay Protection and Toxic Cleanup Program. These actions can be implemented in a manner that satisfies the requirements for TMDL development and is consistent with the time schedule included in the 303(d) list adopted by the Regional Board in January 1998.

For the agricultural pesticide component, there are numerous efforts underway to develop practices that can be implemented to reduce the amount of pesticides entering surface waters. DPR is investigating orchard floor management as a means to reduce discharges of dormant sprays into surface waters. Also, at California State University at Fresno, DPR is investigating the effects of microbial augmentation and post application tillage on runoff of dormant sprays. Dow Elanco and Novartis, the registrants of chlorpyrifos and diazinon, have undertaken a multiyear study in Orestimba Creek in the San Joaquin Basin with the primary objective of identifying specific agricultural use patterns and practices which contribute the bulk of the off-site movement into surface water. The Biologically Integrated Orchard Systems (BIOS) program has received a series of grants from the State and US EPA to implement community based efforts to implement economically viable, non-conventional, pest management practices. Colusa County Resource Conservation District is leading a runoff management project, funded through a Clean Water Act Section 319 Grant, to identify management practices that reduce runoff from almond orchards and thereby reduce pesticide loads to local creeks. The Glenn County Department of Agriculture is organizing local growers and PCAs to address the use of

dormant spray insecticides in the county. The Biologically Integrated Prune Systems program is a community-based project that supports implementation of reduced risk pest management strategies in prune orchards. A similar effort is underway for peach orchards. The UC Statewide Integrated Pest Management Project has a SWRCB grant to identify alternative orchard management practices to prevent or reduce off site movement of dormant sprays, provide outreach and education and initiate monitoring to assess success of new practices. In addition, UC was awarded a three year one million dollar grant by CALFED to identify urban and agricultural practices to prevent and reduce off site movement of diazinon and chlorpyrifos into surface water. The CALFED study will consider both urban and agricultural stormwater runoff and summer irrigation runoff.

For controlling urban sources of pesticides, the Regional Board is implementing the NPDES Storm Water Program. This program is further described under the section heading "Storm Water". In addition to this regulatory effort, interested parties in the Bay Area and Central Valley formed an Urban Pesticide Committee to provide a forum for information exchange, coordination and collaboration on the development and implementation of an urban pesticide control strategy. The Committee has developed a strategy that includes a framework of roles and responsibilities that can be taken by various agencies to reduce pesticides from urban sources. CALFED has earmarked resources to develop management approaches that can be implemented to reduce discharges of pesticides from urban areas. Studies are authorized for the Sacramento urban area and in Suisun Bay.

There are studies underway and planned to try to assess the impact of diazinon, chlorpyrifos and other pesticides on local aquatic communities. The emphasis of these studies will be on the Delta and principle tributaries to the Delta. A study is underway to conduct bioassays with local species exposed to water collected from Suisun Bay. CALFED has supported a study by UC Davis to evaluate contaminant effects on Delta smelt. CALFED has also supported implementation of a toxicity testing program in the Delta that includes identification of responsible contaminants. In addition, CALFED has proposed to fund studies to evaluate the ecological effects of diazinon and chlorpyrifos and other pesticides on Delta aquatic species. Finally, CALFED has proposed to fund studies by the Department of Fish and Game that are needed to complete draft criteria reports for the two pesticides.

Over the next several years, staff will continue to work with DPR and other stakeholders to ensure that management practices are developed and implemented to reduce chlorpyrifos and diazinon concentrations in surface waters. In FY 97-98, staff worked with DPR, registrants and other stakeholders to coordinate studies and discuss results. Staff worked with DPR to develop draft cleanup plans for chlorpyrifos and diazinon. Staff coordinated closely with CALFED to evaluate and refine proposals to support efforts to develop management practices to reduce the discharge of pesticides and to study the ecological significance of measured pesticide levels on local aquatic communities. In FY 98-99, staff will finalize the cleanup plan and assist State Board in preparation of a consolidated cleanup plan that will be submitted to the legislature in June 1999. In addition, staff will continue to work with DPR and stakeholders to assure that

the funded work to develop management practices and to determine ecological significance proceeds and that progress is being made toward implementation of practices. In FY 99-2000, staff will continue to work with DPR and stakeholders to assure that progress is continuing according to schedules developed in the cleanup plan and the schedule included in the Clean Water Act 303(d) list for TMDL development.

CALFED and other agencies are providing resources to develop management practices, to evaluate the ecological significance of pesticides in the Delta and to monitor for toxicity and pesticides. There are inadequate resources to fully evaluate program effectiveness and to work with stakeholders to develop reasonable solutions to the problems.

*Other Pesticides:* Additional work is needed in the Delta to ensure that all the primary chemicals causing toxicity are identified. Previous toxicity studies have identified other pesticides as causing toxicity and there are many instances where toxicity exists and the toxicant has not been identified. Staff needs to coordinate these efforts with DPR and stakeholders.

#### *Fish Tissue Pesticide Problems*

The Toxic Substances Monitoring Program has found elevated levels of Group A Pesticides and DDT in fish tissue collected from Hood on the Sacramento River and from Vernalis on the San Joaquin River. The sources of the chemicals are believed to be from past agricultural use and, in the case of chlordane, from urban use. The use of chlordane, DDT, and toxaphene is now banned and endosulfan use is closely regulated and much reduced. . DeltaKeeper and the Regional Board conducted a joint study of organochlorine pesticide concentrations in sportfish in the San Joaquin Basin and Delta in 1998. Concentrations of DDT exceeded the U.S. EPA screening value in 23% of the samples. All of the samples above the screening value were obtained from the South Delta or lower San Joaquin watershed. The results of this study are consistent with historic data from the TSMP and data from USGS studies indicating that the south Delta and lower San Joaquin watershed are areas with particularly high organochlorine pesticide concentrations. However, overall organochlorine pesticide concentrations have decline considerably since the late 1970's and early 1980's.

There are several other organochlorine pesticides of potential concern in the Delta. Dieldrin exceeded the screening value in one sample. Data were inconclusive for toxaphene. Additional sampling with a lower detection limit is needed to determine whether toxaphene concentrations in Delta fish exceed the screening level. The data indicate that the following pesticides do not represent a potential human health concern in fish tissue: chlordane, endosulfan, endrin, hexachlorobenzene, lindane, mirex, diazinon and chlpropyrifos

## Current Activities and Strategies to address the problem

*Fish Tissue Problems:* The principal sources of Group A pesticides (toxaphene, chlordane, endosulfan and a few other pesticides) and DDT are sediment from Colusa Basin Drain in the lower Sacramento River watershed and a series of small westside agricultural drainages in the lower San Joaquin River watershed. Most of the 303(d) listings for pesticides in fish tissue are based on data collected prior to 1985. Some of the listings are based on relatively few samples. The DeltaKeeper study suggest that it may be possible to delist all Group A pesticides in the Delta with the exception of DDT and possibly toxaphene. To delist the Regional Board will need two more years worth of fish tissue data from the Delta. Extensive fish tissue samples have been collected as part of the CALFED mercury project. All these samples have been archived in a manner appropriate for organochlorine pesticide analysis. Funds are requested to perform these analyses, write up the results and evaluate whether delisting of some or all chemicals are warranted

### Dissolved Oxygen

In January 1998 the Regional Board adopted a revised CWA 303(d) list, which identified low dissolved oxygen in the lower San Joaquin River ("Delta Waterways") near Stockton (Figure 1) as a high priority impairment. A plan for increasing dissolved oxygen to levels that meet the Basin Plan water quality objectives in the lower San Joaquin River was outlined in the Regional Toxic Hot Spot Cleanup Plan (Cleanup Plan). The Regional Board approved the Cleanup Plan in June 1999 and by the Office of Administrative Law in November 1999 (CVRWQCB 1999). The main elements of the Cleanup Plan have been initiated including organization and regularly held meetings of Steering and Technical Advisory Committees, initiation of studies to identify major sources of oxygen demand constituents and evaluation of engineering alternatives to increase dissolved oxygen at critical times and locations in the river.

Low dissolved oxygen typically develops as a local depression in the San Joaquin River Deep Water Ship Channel between the Turning Basin and Turner Cut in late summer and often persists through October. Dissolved oxygen concentrations begin to increase in late fall and winter when cooler water temperature increases oxygen saturation potential and increased river flow decreases hydraulic residence time. A smaller magnitude dissolved oxygen depression occurs sometimes during the spring. Dissolved oxygen concentrations are usually lower in areas where there is little flow-through such as the Turning Basin eastward to Weber Point and dead-end water-bodies such as Smith Canal. In the main stem river, low dissolved oxygen conditions usually occur off the western end of Rough and Ready Island but under certain conditions the depression may extend seaward toward Turner Cut and sometimes as far as Disappointment Slough. The low dissolved oxygen levels are thought to stress and kill local aquatic organisms and may prohibit the upstream fall run spawning migration of Chinook salmon.

Studies are underway for identifying sources and their relative magnitudes and determining feasibility of engineering alternatives. Several preliminary studies were

conducted in the summer and fall of 1999, the major findings of which were incorporated into a draft dissolved oxygen TMDL “issues” report. The principal 1999 findings were that fairly continuous violations of the dissolved oxygen objectives were observed between August and November. Oxygen concentrations ranged between 4 and 7 mg/l in August and September but fell to a low of 1.9 mg/l in early October at the Department of Water Resources continuous dissolved oxygen meter off Rough and Ready Island. Seventy-five to eighty-five percent of the load of oxygen requiring substances came from the San Joaquin watershed upstream of Vernalis. Presumably the major upstream sources were from the discharge of BOD and other nitrogenous wastes by agriculture and publicly owned sewage treatment plants and growth of algae in the San Joaquin River. The City of Stockton and other local deep-water ship channel inputs accounted for 8 to 11 percent of the load. The unassimilated load (amount required to be eliminated to correct the oxygen deficit) was estimated at 8,000 to 42,000 pounds of oxygen per day.

In early October the flow of the San Joaquin River decreased at the City of Stockton from about 900 to 150 CFS. The decrease was caused by changes in the operation of the barriers in the South Delta allowing more of the San Joaquin to flow down Old River to the State and Federal pumps at Tracy. As a result the hydraulic residence time--and the amount of time material had to oxidize in the deep-water ship channel--increased from 10 to 25 days. Dissolved oxygen concentrations immediately fell to 1.9 mg/l, the low of the year. At October low flows, the City of Stockton and other local inputs accounted for about 50 percent of the load. About 30 percent of this load was from the release of ammonia by the Cities wastewater treatment plant. A major challenge of the final TMDL control program will be to develop a cost effective, equitable allocation of loads to correct the low dissolved oxygen problem without having any control of the San Joaquin River and the source of the dissolved oxygen constituents.

The Steering Committee secured an \$860,000 grant from CALFED to continue research during the summer of 2000. Major emphasis is to again determine the sources and unassimilated loads of oxygen requiring substances in the deep water ship channel. In addition, the grant will begin to evaluate the sources of oxygen requiring substances upstream of Vernalis and management options to correct the dissolved oxygen problem.

#### Current Activities and Strategies to address the problem

The Steering Committee applied for a second CALFED grant to continue to conduct research on the causes and most cost effective solutions to solving the dissolved oxygen problem. Unfortunately, the grant was not recommended for funding. The Steering Committee intends to appeal the loss of funding to the Bay-Delta Advisory Council in the hope of securing directed action funding. In the interim, the key elements of the proposal are listed below, as collection of this information will be necessary to satisfactorily complete the TMDL. Money is being requested for projects in the San Joaquin basin and deepwater ship channel. For the deepwater ship channel, funds are needed to collect additional field data to refine and validate the Chen dissolved oxygen model. This data is best collected by installation of a series of remote dissolved oxygen and chlorophyll sensors and validating their readings with weekly cruises along the 15-mile length of

channel. The City of Stockton has committed to co-share the cost of the field monitoring up to \$50,000 per year. Funding will also need to be secured to begin to evaluate control measures within the Delta. The two primary control measures being evaluated are the cost and feasibility of increasing aeration in the deepwater ship channel and the installation of high volume low head pumps at the barrier at the head of Old River. Funding is also needed to continue using the services of a facilitator for Steering Committee meetings.

Funding will also be needed for research in the upper San Joaquin Basin as the studies conducted in 1999 found that the San Joaquin was under some circumstances the source of up to 75 percent of the load of oxygen requiring substances. Money is needed to determine the source and magnitude of the upstream nutrients, develop a model that converts these loads of nitrogen and phosphorus into algae, compile a list of possible BMPs for nonpoint source users to employ to reduce loads and fund development of an implementation plan.

### Urban Pesticides

The Regional Board received an US EPA 104(b)(3) grant to identify the pollutants causing toxicity in wet weather urban runoff from back sloughs around the City of Stockton. Testing in 1994 identified toxicity to each of the three species. Diazinon and chlorpyrifos were implicated by both TIE and chemical analysis as the primary cause of invertebrate bioassay mortality. Studies in subsequent years, as part of the BPTCP, confirmed the presence of these pesticides in urban runoff and back sloughs at concentrations that are toxic to sensitive invertebrates. Diuron was identified as a cause of algal toxicity. There were many instances where toxic conditions were measured but no specific toxicant was identified.

Fish kills are reported each year in channels around Stockton after the first large storm of the year. In 1994 U.C. Davis observed high BODs in water collected from Smith Canal, the Calaveras River, Mosher Slough and 5 Mile slough. Ambient dissolved oxygen levels were less than 1 mg/l (the Basin Plan objective is 5 mg/l or 6 mg/l depending on the location) in all the waterways after the first major storm of the year (Connor in prep). Experiments in the lab suggested that the cause of the fish kills was asphyxiation. In 1995 staff observed low dissolved oxygen associated with fish kills after the first storm of the year. In 1996 and again in 1997 DeltaKeeper reported low dissolved oxygen levels in all four waterways. Little suppression in dissolved oxygen has ever been noted in any storm runoff event after the first flush.

Potential problems exist in the vicinity of other urban areas in the Delta (e.g., near Antioch). Also, of concern is the residential growth in both the southern and eastern portions of the Delta, (San Joaquin County and Contra Costa County).

### Current Activities and Strategies to address the problem

*Stockton Urban Area:* The organophosphate insecticides chlorpyrifos and diazinon have been observed in City of Stockton runoff at concentrations causing bioassay toxicity in back sloughs. Algal toxicity from diuron has also been observed. Similar water quality problems have been observed in City of Sacramento runoff suggesting that these pesticides are regional concerns. The City of Stockton presently has an urban runoff monitoring program to confirm these results. It is proposed that follow-up occur after the City of Stockton completes its study, including definition of the causes of toxicity in urban runoff.

Fish kills from low dissolved oxygen levels appear to be a regular occurrence in several Stockton back sloughs including Smith Canal, Mosher Slough, 5-Mile Slough and Calaveras River. Fish kills are associated with the first rainfall runoff of the year. Problems in Smith Canal have been documented every year since 1994. The City of Stockton has agreed to conduct a monitoring study in Smith Canal to verify that low dissolved oxygen levels were associated with storm runoff and to determine the temporal and spatial extent of the impairment and ascertain the constituents in stormwater that cause dissolved oxygen depletion. A final report is expected in summer 1998. If the study is unsuccessful in ascertaining the constituents responsible for the high oxygen demand, then it should be repeated with the purpose of identifying the causes. If the study is successful then three follow-up actions are recommended. First, repeat the Smith Canal study in the other urban sloughs to confirm that the same constituents are responsible for the oxygen deficit in all waterways. Second, conduct a study at Smith Canal to evaluate control options to reduce the input of material with high oxygen demand. Finally, a plan should be submitted to the Regional Board describing how the preferred control options will be implemented throughout the storm water district.

*Southern and Eastern Delta Urban Areas:* There is considerable residential growth along waterways in both the southern and eastern portions of the Delta (San Joaquin and Contra Costa Counties). With proper planning, problems associated with urban runoff can be avoided. Identification of the responsible toxic chemicals is an essential first step in the development of control strategies to reduce toxicity. For example, if toxicity from oil and grease or metals is occurring, then the fix may involve the construction of holding basins. These are most economically built during the initial development of the urban area. Construction later is prohibitively expensive. Holding basins may also ameliorate oxygen deficit problems. On the other hand, little pesticide removal is likely to occur in settling basins. Outreach and public education programs may be more successful here. Therefore, Board staff believes that identification of the cause of toxicity in urban runoff within the Delta should be a high priority concern.

### Salinity

The seasonal pattern of salinity is important to the Delta ecosystem. Elevated salinity also impairs agricultural water uses. The main sources of salt to the Delta are from the San Joaquin River and from oceanic intrusion of saltwater. In the past conditions have not been optimum for protection of agricultural and aquatic life beneficial uses. The

State Board adopted a Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary in May 1995 prescribing salinity standards within the Delta and is currently developing an implementation plan to achieve compliance with the standards. Staff needs to develop a program to reduce levels of salt entering the Delta from the San Joaquin River and assure continued low salinity in the Sacramento River (see San Joaquin River State of Watershed the Report).

#### Current Activities and Strategies to address the problem

The State Board is addressing salinity in the Delta. The Regional Board is initiating a program to reduce salt inputs to the Delta from the San Joaquin River (see San Joaquin River Initial State of the Watershed Report).

#### Ballast Water Discharge

Ocean going vessels discharge ballast water in the Delta as they navigate through the waterways on their way to unload cargo. The ballast water may contain salt, oil and grease, heavy metals, pathogens from on-board sewage, and foreign aquatic species that could adversely compete with native species. The Bay/Delta system is recognized as the most invaded aquatic ecosystem in North America, with more than 200 introduced invertebrates, fish, plants and microorganisms. The introduction of nonindigenous species has been identified as a critical factor affecting the aquatic life beneficial uses of the Bay/Delta system. Ballast discharges are uncontrolled and the Regional Board has little direct authority over the discharges.

#### Current Activities and Strategies to address the problem

Ballast water discharges have greatly impacted the Bay/Delta system. Introduced species have widespread impacts on native species and threaten the integrity of the aquatic ecosystem. In addition, ballast water may contain salt, oil and grease, heavy metals and pathogens. CALFED has directed resources to start to address the introduced species component of ballast water. Much more research and study will be required to develop workable solutions to this part of the problem. Research is also needed to determine how severe the water quality impacts are from the other contaminants in ballast water. The Regional Board and Fish and Game need to get together with the shipping lines, Coast Guard and Ports to develop a plan to minimize any impacts and, if necessary, to work to develop policies and regulations to control the discharges. This work is not funded.

#### Vessel Sewage Discharges

There are thousands of boats in the Delta used both recreationally and for permanent residences. Raw and partially treated sewage is dumped into Delta waterways from many of these boats. Sewage pump out facilities are available at several locations, but are not used by all boaters. Many vessels used for permanent residences cannot move, so can not use pump out facilities

### Current Activities and Strategies to address the problem

Staff is participating on a limited basis with the Coast Guard and a local agency Task Force to study and eliminate the discharges, but resources of the Regional Board and other agencies are inadequate to properly address the issue. The issue may become much more prominent if the Regional Board places the Delta on the 303(d) list as impaired because of high pathogen concentrations.

### *Abandoned Vessels*

There are many derelict and abandoned vessels in the Delta,. The boats contain fuels and other chemicals that can contaminate surface waters and are a navigation hazard. Abandoned boats are often used as shelter for the homeless, but no sewage facilities are available, so sewage is discharged to the waterways. Abandoned vessels have also been used for drug labs, with toxic chemicals being left on the boats or dumped overboard.

### Current Activities and Strategies to address the problem

The Regional Board has no resources to evaluate or respond to this water quality threat beyond some limited participation in an inter-agency task force

### *Dioxins and Polychlorinated Biphenyls (PCBs)*

The San Francisco Regional Monitoring program demonstrated in 1993 and 1994 that dioxin and total PCB concentrations were above US EPA recommended criteria to protect human health at all sites surveyed in San Francisco Bay including the confluence of the Sacramento and San Joaquin Rivers in the Delta. Furthermore, clam transplant studies demonstrated that some of the highest total PCB tissue concentrations were obtained from animals located in both Rivers. The data was interpreted to mean that the Rivers were a major source of PCBs to the Delta. Not known is the impact of elevated PCB levels on aquatic biota in the Estuary.

In 1998 the Central Valley Regional Board and DeltaKeeper collected fish from the San Joaquin Basin and Delta for PCB analysis. The Sacramento River Watershed Program has also been collecting fish for analysis. No dioxin work has been done in the basin because of the high cost of dioxin analysis. Concentrations of PCB's above the U.S. EPA screening level were frequently detected. Thirty percent of the largemouth bass and white catfish in the DeltaKeeper study were above the screening value (6 of 11 catfish and 3 of 19 largemouth bass). Data from this study and the SRWP suggest that PCBs are elevated in localized hot spots rather than on a regional basis. Smith Canal particularly stood out in this study with high PCB concentrations in both white catfish and largemouth bass. The Port of Stockton also had relatively high PCB concentrations in the two fish species and in Corbicula. PCB congener profiles ("fingerprints") indicate the presence of varying sources at different locations: Aroclor 1260 in Smith Canal, Arochlors 1248 and 1254 at Stockton, and Aroclor 1262 at the Stanislaus River. The limited long-term data for the Delta suggest declines in PCB concentrations, but

concentrations in a few locations remain high relative to historical results and above human health screening values.

The source of the elevated PCB levels in the Stockton Deepwater ship channel has been traced to McCormick and Baxter Creosoting Company located immediately upstream of the Port. The facility has been designated a U.S. EPA Superfund site and a County health advisory issued warning anglers to limit consumption of locally caught fish.

#### Current Activities and Strategies to address the problem

Follow-up studies need to be coordinated with the San Francisco Bay Regional Board to confirm the spatial and temporal extent of the exceedance of US EPA recommended criteria for dioxins and PCBs in the Sacramento and San Joaquin Rivers and Delta. This work is probably best carried out by conducting a comprehensive fish tissue contamination study. For PCB's the goal should be to verify that the Regional Board has identified all local hot spots and that remediation work is underway in each of these. For dioxins the goal should be the first comprehensive tissue evaluation in the basin. The valley wide fish body burden study should be coupled with a comprehensive fish consumption study to determine the magnitude of the problem and the local populations most at risk. This information can be used to help prioritize cleanup, post fish consumption advisories and outreach to specific populations advising them of the associated health risks.

#### Metals

San Francisco Bay exceeds Basin Plan water quality objectives for copper. Estuarine loading estimates suggest that more than half of all the copper load to the Bay is from river inputs. Most of the copper in the Central Valley is thought to originate from mine runoff. An additional metal concern is that metal loads entering the Delta may accumulate to toxic levels in the sediment.

#### Current Activities and Strategies to address the problem

Recent and ongoing mine abatement work at a few sites in the lower Sacramento River watershed and upstream should significantly decrease metal loads to the Delta. Continued metal monitoring is needed to demonstrate that metal loads are decreasing. Much of this work is presently being done by the Sacramento Ambient Monitoring Program (see Sacramento River Initial State of Watershed the Report). Other mines in the watersheds tributary to the Delta contribute to loads of metals entering the Delta. A review of the existing abandoned mine ranking is required to address the potential impact to surface waters from discharges from mine tailings, waste rock and overburden and open pits. The present list is based on the direct discharge of mine drainage from portals and large seeps. Wet weather and storm events can cause significant runoff of mine waste directly into wetland areas and surface waters. The best approach would be to use a watershed coordination committee to reassess the existing ranking and assist the Regional Board in developing a multi-stakeholder approach to addressing high priority

mine sites. This approach will address point source and nonpoint source discharges from mine sites, funding alternatives, and mitigation technology issues. The program needs to include coordinating with other agencies and stakeholders, developing a revised priority list, conducting site assessments at high priority sites, and developing alternatives for funding abatement projects.

### Sediment

Various areas of the Delta contain sediments that may be toxic to aquatic life. These areas appear to be associated with industrial dischargers and spills. In addition, dredging and dredge material disposal activities in the Delta have the potential to cause water quality problems. These activities must, however, take place to maintain two deep-water ship channels and over 1,000 miles of levees. Dredging activities are also performed to improve water conveyance systems and intake structures. Water quality impacts can occur at the dredge site and at the site of disposal or reuse. Contaminants and chemical changes in the material can threaten both ground water and surface water quality. The reuse of dredge material for construction of wetlands, enhancement of channel islands, and the rehabilitation of levees is being considered. To a smaller degree, dredging has been used to mitigate potential toxic hot spots. Sediment quality criteria for the various types of reuses and disposal environments are required to ensure that water quality and beneficial uses are protected.

### Current Activities and Strategies to address the problem

Basic scientific knowledge of safe levels for sediment pollutants to protect surface and ground water quality and biologic communities is generally lacking for dredging and dredge disposal/reuse. Dredging will continue for channel maintenance and new construction. Increasingly, however, dredge material is seen as a source of material for levee maintenance and habitat development. There is great need for large volumes of low cost material to improve Delta levees and dredge material is a potential source. Large volumes of dredge material may be available from the San Francisco Bay area, but the surface and ground water impacts of the salt in saline dredge material is unknown and must be quantified. The Regional Board is working with other agencies, including CALFED and the Department of Water Resources, to develop funding and studies to address these issues. Additional pilot studies may be implemented to clarify technical issues. Eventually General Waste Discharge Requirements will be adopted to address these issues and streamline project review and approval. Any policy or waste discharge requirement adoption requires CEQA compliance and potentially adoption of an EIR. Staff is in the process of collecting the technical information needed to develop an EIR for a general order WDR.

Several large dredging projects with the potential for sediment reuse are being considered (Baldwin Ship Channel and Sacramento and Stockton Deep Water Ship Channels and the Interim South Delta Project). Small-scale demonstration projects have been completed in an attempt to address a number of issues. However, not enough information has been provided to fully evaluate the potential impacts. Staff will work with dischargers,

reclamation districts and agencies to streamline the permitting process for these projects. A key component will be development of generic sediment criteria for various material reuse scenarios. Staff is working with CALFED to direct resources to addressing sediment reuse issues in the Delta.

### Sediment Objectives

Staff has developed interim screening values and test methods to use in current dredging permits. An approach for more in depth analysis has been determined and the collection of information has begun. Working in conjunction with Delta Protection commission and Department of Fish and Game, staff is analyzing past sediment data to determine constituents of concern, potential exposure pathways and scientifically valid test methods and screening criteria. Staff is working with CALFED to propose pilot projects to assess longterm impacts from dredge material reuse. The current focus is on reuse in an upland environment. Additional resources would be necessary to address wetland or aquatic habitat enhancement using dredge material.

The short term goal is to provide technical analysis to be used for an EIR for General Orders for dredging. This would streamline the process for permits for small dredge projects. As part of the CALFED task force, we will work with the Delta Protection Commission and Fish and Game to produce a document to lay out a strategy for developing a dredge material management plan (DMMP) that could be adopted as a basin plan amendment. The DMMP will lay out a decision-making framework, including test methods and screening values, for dredging projects and dredge material reuse. Two staff people are needed to develop the General Orders and begin work on the DMMP as a Basin Plan amendment. An Additional staff person is needed to address the technical issues regarding saline dredge material and write WDRs for pilot studies.

## **GROUND WATER**

### Drinking Water

Various areas of the Delta contain ground water that does not meet drinking water standards. The accedence's appear to result from natural causes and from inputs of pollutants from a variety of point and nonpoint sources, including agricultural operations, underground and above ground tanks, industrial facilities, commercial facilities, military facilities, landfills, waste management units and other spills and leaks. As in the other watershed in the Region, MTBE in groundwater is a concern in the Delta.

### Current Activities and Strategy to address the problem

There are numerous agencies, Boards, special committees, and groups that have an interest in the Delta and implement programs that influence water quality. Regional Board staff participates on various committees and work groups that address pollutant related issues. The Regional Board does not intend to try to manage the Delta. Instead, the Board intends to remain focused narrowly on pollutants and pollutant related issues.

Staff will coordinate closely with the CALFED Bay-Delta Program and the committees formed to guide implementation of the San Francisco Estuary Project's Comprehensive Conservation and Management Plan (CCMP). More staff time is needed to provide CALFED with adequate Regional Board input for evaluating, selecting and implementing strategies to reduce levels of pollutants in the Delta.

#### Marina Study

A number of marinas in the Delta require dredging for maintenance of their basin and for cleanup of past spills. Many small marinas have not conducted required maintenance dredging due to the regulatory process and high cost of sediment and water quality assessments. A program needs to be initiated to address permit streamlining, sediment quality, dredge material reuse, and financing for small marina dredging and disposal. This should be done with the active participation of local stakeholders. The program would involve conducting sediment quality surveys, developing management practices, developing a finance plan, preparing a general order, and conducting a cooperative monitoring program.

## **SECTION V. STATE OF THE WATERSHED REPORT TULARE LAKE WATERSHED**

### **Watershed Description**

The Tulare Lake Watershed comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. The Tulare Lake Watershed is essentially a closed basin since surface water drains north into the San Joaquin River only in years of extreme rainfall. The Watershed includes six groundwater basins: Kern County, Tulare Lake, Tule, Kaweah, Kings and Westside basins.

The Watershed is divided into six watershed management areas. Each area is defined as the designated groundwater basin including the surface waters that are tributary to each groundwater basin. Thus, the Kern County Basin Management Area includes the Kern River and the Poso Creek drainage areas, as well as the drainage areas of westside streams in Kern County. The Tulare Lake Basin Management Area consists of the historical lakebed. The Tule Basin Management Area includes the Tule River, Deer Creek, and White River drainage areas. The Kaweah Basin Management Area includes the Kaweah River and Yokohl Creek drainage areas. The Kings Basin Management Area includes the Kings River drainage area as well as the drainage area for the tributaries and distribution systems of the Kings River. The Westside Basin includes the drainage areas of westside streams in the Kings and Fresno counties.

### **Water Quality Assessment, Strategies and Current Activities**

#### **SURFACE WATER**

##### *Kings Basin Management Area*

There are elevated bacteria levels in Pine Flat Reservoir. Phytoplankton biostimulants were measured in Sequoia Lake. The potential exists for high bacteria levels in Sequoia Lake. Unusual algal blooms have been identified in the Upper Kings River by Cedar Grove and unusual foaming has been observed at Ten Mile Creek, a tributary to the Kings River.

##### *Strategy and Current Activities*

A dissolved oxygen assessment on the Kings River is needed. The dissolved oxygen objective of 9.0 mg/l for the Kings River from Pine Flat Dam to Friant-Kern Canal may not be achievable due to natural conditions. Dissolved oxygen needs for the beneficial uses in this reach should be assessed. If necessary, dissolved oxygen objectives will be modified to fully protect beneficial uses.

### Tulare Lake Basin Management Area

The Lower Kings River occasionally contains electrical conductivity and TDS higher than Basin Plan objectives. Problems were common during the critically dry years from 1987 to 1994. Molybdenum levels in the River are also high enough to impact agricultural beneficial uses. Fish from the river contain elevated levels of copper, arsenic, toxaphene, and Group A pesticides.

The Lower Kings River is on the Clean Water Act Section 303(d) list because of salt, pesticides, molybdenum, copper and arsenic. Total maximum daily load development is scheduled to start in 2003.

### Strategies and Current Activities

As previously mentioned, the Kings River is on the Clean Water Act Section 303(d) list. Addressing problems in 303(d) listed water bodies is a high priority.

Salinity problems in the Lower Kings River (in the Tulare Lake Basin Management Area) need to be assessed. From 1987 to 1994, critically dry years, the Lower Kings River did not meet the Basin Plan objectives for pH and electrical conductivity, boron, chloride, molybdenum, and sulfate. The causes were due to a lack of fresh water and discharges of agricultural wastewater with high salinity and trace elements. After a few wet years, the conditions in the Lower Kings River improved and all water quality objectives are being met. Monitoring of the Lower Kings River and the major discharges continues to be conducted by the Kings River Conservation District. These results will continue to be reviewed and high electrical conductivity discharges will be characterized. Beneficial use impairments will be identified. If necessary, a plan to protect the quality of the Lower Kings River will be developed.

Additional work is needed in the Lower Kings River to survey beneficial uses of the river and develop objectives to protect all beneficial uses. Discharges that impact the uses will be identified. Stakeholder involvement will be solicited to develop potential mitigation measures to improve the quality of discharges or reduce the quantity of discharges to the River.

### Kaweah Basin Management Area

Fish in Kaweah Lake are reported to contain elevated levels of copper, arsenic, and silver. Sedimentation has been noted in the lake. The potential exists for high bacteria levels in the river and the lake.

### Tule Basin Management Area

Sedimentation has been noted in Lake Success. Also, the potential exists for high bacteria levels in the river and the lake.

### Strategies and Current Activities

A beneficial use assessment needs to be conducted for the surface waters in the Tule Basin Management Area. The Basin Plan designated beneficial uses for all surface water in the Tulare Lake Basin, either individually, as in the case of the Kings River, or generally, as is the case with Eastside Streams. Individual water bodies are broken down into reaches and beneficial uses are identified for each reach. Some of these reaches are large with varied beneficial uses throughout them. General beneficial uses cover a large number of water bodies that vary greatly in character; some are rivers and some are small ephemeral streams. The beneficial uses of these water bodies may vary, but the designated beneficial uses do not reflect this variability.

### Westside and Pleasant Valley Basin Management Area

High sedimentation and selenium loads originate from the Panoche Creek Watershed. San Carlos Creek has high levels of mercury that also cause high levels of mercury in Panoche Creek. The sources of the mercury are mines.

San Carlos Creek is on the Clean Water Act Section 303(d) list because of mercury. Panoche Creek is on the Clean Water Act Section 303(d) list because of sediment, selenium and mercury. Total maximum daily load development is scheduled to start in 2003.

### Strategies and Current Activities

A program is needed to reduce sediment and selenium loads from the Panoche Creek Watershed in the Westside and Pleasant Valley Portions. During all rain events, large amounts of sediment and selenium are carried out of the Panoche Creek Watershed to westside soils. During rain events with greater than a five year return period, sediment and selenium are carried into the San Joaquin River and contribute to the river exceeding its water quality objectives. A coordinated resource management group has formed for the Panoche/Silver Creek Watershed to assess these problems and identify solutions. The Regional Board continues to work with this group to protect the surface and groundwaters affected by this watershed.

In the Arroyo Pasajero, large flood flows carry sediments out of the upper watershed. The water and sediments have affected the California Aqueduct. The Stewards of the Arroyo Pasajero CRMP formed to address this problem. The Regional Board continues to work with this group to protect surface and groundwaters affected by this watershed.

Studies are needed to develop a plan to control mercury discharges from mines to San Carlos Creek.

### Kern County Basin Management Area

Some sedimentation problems are noted in Isabella Lake.

### Monitoring

There has been no comprehensive monitoring and assessment program for surface waters implemented in the Basin. Baseline monitoring is needed to define long-term trends in water quality downstream from the major reservoirs. Additional work is needed to characterize water quality conditions in waters upstream of reservoirs. The problems observed on the Upper Kings River should be monitored to identify sources of algal blooms and foaming.

### Fish Tissue Studies

Studies need to be conducted in Pine Flat Reservoir, Lake Success, Lake Kaweah, and Lake Isabella. Reservoirs tend to serve as sinks from contaminants and fish from many other reservoirs in the region have elevated levels of mercury and/or pesticides and PCBs.

### Erosion

In addition to the sedimentation problems noted above, with each rainfall, some surface waters of the basin run brown implying that there is a large quantity of sediments in the water. No review of potential sediment sources has been done. Improperly graded subdivisions are believed to contribute large quantities of sediment as do eroding roads, grazing, and other activities. These sediments may be impairing the municipal, recreational, and habitat beneficial uses of affected waterbodies.

### Strategies and Current Activities

The Basin Plan has erosion control guidelines that do not adequately protect the basin's waters. The guidelines must be reviewed and the deficiencies corrected. The sources of erosion must be targeted for application of management practices. Two sources which should be investigated immediately is grading in new subdivisions and road maintenance and construction activities.

## **GROUND WATER**

### Monitoring

There has been no comprehensive groundwater monitoring implemented in the Tulare Lake Basin. There will never be enough resources to conduct a watershed wide assessment. Staff has formed an advisory committee to focus on the Kings Groundwater Basin. The committee's goal is to conduct a demonstration project to identify key players, develop efficient monitoring protocols, and provide baseline information. However, due to the State Board withholding the Regional Board's allotment of groundwater monitoring funds, the committee has decided that resources are only available to develop a report identifying the parties that need to be involved, the protocols to identify suitable wells, the resources that would be needed, and the data storage requirements.

### Nitrates

There are nearly 400 square miles of groundwater in the Basin with elevated nitrate levels. Water supplies are impacted in Delano, McFarland, Wasco-Shafter, Bakersfield, Maricopa, Taft, the Hanford-Lemoore area, the west side of Kettleman City, the Fresno-Clovis metropolitan area, the area around Kingsburg, and the Reedley-Orange Cove area. Some control of nitrates has been achieved through the controlled use of septic systems in larger subdivisions and agriculture's efforts in recent years to apply fertilizer at agronomical rates. The principle sources of nitrates are believed to be from agricultural operations and from dairies.

### Strategies and Current Activities

Irrigated agriculture and animal confinement facilities contribute nitrate loads to groundwater. The Regional Board maintains a baseline dairy regulatory program, which partially addresses this source of nitrates. There is no monitoring program to assess contributions of nitrates from dairies to groundwater. There is no program to address irrigated agricultural contributions. Nitrates from wastewater treatment facilities and sludge disposal are addressed in the Non-Chapter 15 Program.

A comprehensive monitoring program needs to be implemented to determine if current provisions adequately protect groundwater. A nutrient balance study is needed in the Tule Management Area. Effects of confined animal facilities can be evaluated from this basin portion. This would build on an ongoing nonpoint source project in the basin.

### Salinity

The Basin is arid and closed. To become and continue as a highly productive agricultural area, vast quantities of supply water are imported. While the imported water is of excellent quality, its sheer magnitude equates to millions of tons of salt imported each year. Historically, large quantities of salts have come from oil field production. Regulation of these discharges has reduced the salt discharge. Evaporation basins collect and dispose of hundreds of thousands of pounds of salt each year. Evaporation basins are an interim solution to disposing of salts until determined environmentally benign. In addition, agriculturally based industries concentrate salts in their processes. Several industries (i.e. olive processors) and municipalities have created local plumes where salt concentrations have caused groundwater pollution. Fertilizers, soil amendments, and leachate from affected soils are additional sources of salt.

Elevated levels of salinity impact more than 1800 square miles of valley floor groundwater aquifers. Impacted areas include the valley floor in the western portion of Kern County, Kings County, Tulare County, and Fresno County.

### Strategies and Current Activities

A basin-wide assessment is needed to determine if current provisions adequately protect the quality of water in the watershed. The Water Quality Control Plan for the Tulare Lake Basin specifies that groundwater monitoring should be undertaken to detect long-term trends and to identify problem areas for further study.

### Selenium

Elevated levels of selenium affect more than 100 square miles of groundwater. Parts of the Kern County, Tulare Lake, and Westside basin areas have elevated selenium. The source of selenium is natural but agricultural practices compound the problems.

Shallow groundwater that is drained to allow agricultural production contains salts and selenium. This water is discharged to evaporation basins where the salt and selenium concentrate. Elevated selenium in some cases has caused avian problems.

### Strategies and Current Activities

Since 1985, staff has collected samples at evaporation basins to assess trace element concentrations, including selenium. Avian studies conducted by the U.S. Fish and Wildlife Service documented avian impacts associated with elevated selenium levels at some evaporation basins. In 1993, the Board issued waste discharge requirements that required habitat to mitigate for selenium-induced impacts to wildlife. From 1997 to 1999, four requirements were updated incorporating U.S. Fish and Wildlife Service models that determine necessary habitat to mitigate for selenium induced impacts. Three operators are proceeding to address relevant CEQA issues as required by the State Board. Some evaporation basins have closed. Closed basins pose little threat of selenium exposure to wildlife. Annual sampling inspections of seven active operator's 10 evaporation basins will be conducted in each FY. Drainage Operation Plans, quarterly self-monitoring reports, annual self-monitoring reports from each of the seven active operators will be reviewed each FY. Staff conducts an annual meeting on monitoring to solicit input from trustee agencies. In summary, staff is working with seven active evaporation basin operators and six inactive operators. Resources are adequate to conduct the regulatory program. The program consists of updating existing permits, conducting inspections, taking enforcement actions, reviewing closure and environmental reports, and follow-up activities to the San Joaquin Valley Drainage Program.

### Oilfields

Most oilfield wastewaters contain salts, oil and grease, and organics that present a threat to the beneficial uses of underlying good quality groundwater. Oil field wastewaters are considered either designated or non-designated wastes. There are more than 800 oilfield waste dischargers, of which 250 are regulated under waste discharge requirements. Many of these requirements are outdated. The program includes issuing permits for existing facilities, revising existing permits, conducting inspections, taking enforcement actions,

responding to appeals and addressing complaints. About 1.9 PYs of the Regional Board's Chapter 15 budget and 0.10 PYs of the Regional Board's Non-Chapter 15 budget is allocated to oilfields. Currently, there is a backlog of existing facilities which needs updated requirements. Resources are inadequate to permit and inspect all of the facilities, and complete enforcement actions.

## **APPENDIX 1 – REGIONAL PRIORITIES**

## Regional Priorities

The Regional Board does not conduct water quality improvement projects but provides assistance and oversight, as necessary, for local stakeholders to complete projects that address regional priorities.

For cases where stakeholders are best suited to provide stewardship efforts to protect and enhance water quality in local streams, the Regional Board supports projects that address the water quality priorities as described in Table 1. Table 2 describes the projects, needs and activities that staff believe reflect the water quality priorities within individual subareas. However, funding is limited and competitive. Projects included in the Targeted Projects Table are not guaranteed funding. All proposals will be evaluated against the water quality priorities at the time proposals are ranked. Priority projects should result in measurable improvements in water quality and contribute to ongoing implementation at a reasonable expense. Current statewide emphasis is on projects that implement TMDLs. Please note that priorities and projects are not listed in any priority or ranked order.

For cases where improvements are needed for municipal and domestic wastewater treatment, financial assistance may be provided to address identified public health hazards, water quality problems or to provide for reusing wastewater to offset the use of fresh/potable water. Funds are available from various sources, including the State Board, US EPA, the California Department of Housing and Community Development, California Department of Water Resources, and the California Infrastructure and Economic Development Bank.

Grants administered by the State Board for wastewater treatment plant improvements are limited to small communities with financial hardships. The State Board grant priorities are currently under development.

The State Board also administers a low interest State Revolving Fund Loan program for wastewater treatment plant improvements that does not have community size or income requirements. Current State Revolving Loan priorities for Region 5 may be found at:

<http://www.swrcb.ca.gov/cwphome/srf/rb5.html>

**Table 1: Water Quality Priorities**

<b>Identification Number</b>	<b>Priority Description</b>
1	Projects which assess source loading and implement existing TMDL programs for nonpoint source pollutants (e.g. selenium, nutrients, pesticides, bacteria, sediment, and temperature) in areas of identified beneficial use impacts.
2	Projects which identify sources and reduce loadings of pollutants from irrigated agriculture and implementation of management practices to mitigate/reduce nonpoint source pollution from irrigated and non-irrigated agriculture (including pesticides, salts, sediment, nutrients, pathogens, selenium, boron, organic carbon, and other pollutants), and monitoring programs which demonstrate effectiveness of these practices.
3	Projects which support capacity to establish and implement locally directed watershed management programs: i.e. programs which include watershed assessments, development of watershed management plans, establish watershed data management capacity, implementation of watershed management plans, community watershed education, and watershed monitoring.
4	Implementation of watershed education, including citizen monitoring, community outreach and involvement and/or K-12 education programs.
5	Projects which improve or restore natural functioning condition of stream channels (i.e. restore floodplain access, reduce accelerated erosion, improve aquatic and riparian habitat - including fisheries, restore natural hydrologic regimes, improve water quality).
6	Projects which address invasive, exotic vegetative species resulting in enhancement of water quality, quantity and/or habitat conditions.
7	Protection, restoration, and enhancement of sensitive watershed lands through easement/fee title acquisitions and other means to avoid or reduce water quality impacts from encroaching land uses.
8	Projects which improve upland conditions (i.e. fuels management, wildlife habitat enhancement, range improvement, etc.) and result in improved water quality and aquatic habitat conditions.
9	Projects which lead towards implementation of the CA Rangeland Water Quality Management Plan, SWRCB, 1995 (i.e. development and implementation of individual Ranch Plans, projects which improve livestock management for purposes of water quality and aquatic habitat enhancement).
10	Projects which identify sources and reduce loadings of pollutants (i.e. pesticides, oil/grease, nutrients, pathogens, etc.) from urban storm water discharges.
11	Projects which address groundwater contamination by nitrates, pesticides, and salinity in areas of identified beneficial use impacts.
12	Studies and implementation projects which address discharges of mercury and other heavy metals from a variety of sources including abandoned and inactive mines.
13	Technical assistance and outreach in regards to nutrient management in croplands for animal feeding operations.
14	Projects that assess the water quality and beneficial use conditions of waters in the region, especially ephemeral, intermittent, or low flow streams dominated with waste discharges.
15	Projects that assess impacts of various land use practices on drinking water sources and develop implementation measures to protect these waters.

**Table 2: Targeted Projects, Needs or Activities**

Project Type and Description		Watersheds, Subwatersheds, and Subareas (by Hydrologic Unit Number and Name)												
		505, 506, 525, 526, 527, 562	518	522, 523, 524	507, 509, 521	504, 508	510	512, 513	516, 517	514	511, 515, 519, 520	53x, 541, 542, 542, 543	544	55x
		Northeast Subarea (Pit River, McCloud River, and Upper Sacramento River)	Upper Feather River Subarea (North, Middle/South Forks of Feather River above Lake Oroville)	Westside of Sacramento Valley (Cottonwood, Redbank, Elder, Thomas, and Stony Creek)	North and Eastside Sacramento Valley (Clear, Cow, Bear, Battle, Mill, Deer, Big, Chico, and Butte Creeks)	Sacramento River (Redding to Hamilton City)	Sacramento Delta	Southwest side of Sacramento Valley Subwatersheds	Yuba and Bear River Subwatersheds	American River Subwatershed	Lower Sacramento Valley Floor Subwatersheds (Sacramento River from Hamilton City to I St. Bridge)	San Joaquin River Watershed	San Joaquin Delta	Tulare Lake Watershed
	<b>Implement BMPs/Improve Water Quality</b>													
1	Projects which support capacity to establish and implement locally directed watershed management programs: including implementation of existing watershed management plans	X	X	X	X	X	X	X	X	X	X	X	X	X
2	Implementation of BMPs to mitigate/reduce nonpoint source pollution from irrigated and non-irrigated agriculture (including organic carbon, pesticides, salts, sediment, nutrients, pathogens, and other pollutants)	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Projects which provide technical assistance and/or implement demonstration projects to address nutrients, BOD, and other pollutants from dairy wastes						X	X	X	X	X	X	X	X
4	Implementation of control systems by local water/drainage districts to manage the water quality of discharges into natural water bodies						X	X	X	X	X	X	X	X
5	Projects which implement nutrient reduction plans in areas of identified beneficial use impacts	X					X	X	X	X	X	X	X	X
6	Projects which lead towards implementation of the CA Rangeland Water Quality Management Plan, SWRCB, 1995 (i.e. development and implementation of individual Ranch Plans, projects which improve livestock management for purposes of water quality and aquatic habitat enhancement)	X	X	X	X			X	X	X	X	X	X	X
7	Projects which specifically address accelerated erosion and sediment discharge/deposition and elevated stream temperatures.	X	X	X	X		X	X	X	X	X	X	X	X

Information regarding potential funding sources may be found at the following website: <http://calwatershedfunds.org/index.php>

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16	Promotion of orchard grower adoption of state-of-the-art pesticide sprayer technology through a program of field day demonstrations and providing loan units to growers; also to include providing growers the use of Pessl instruments to identify defects in their existing spray equipment (nozzle spray patterns, calibration) and to optimize their equipment to match sprayer discharge pattern to canopy of their individual orchards.					X	X				X	X	X		
17	Urban Creeks Pesticide Management Program – implement pesticide management program						X				X	X	X		
18	Implementation and evaluation of BMPs for the Clear Lake Mercury Control Program							X							
19	Implementation and evaluation of BMPs for the Cache Creek Mercury Control Program (evaluate modification to settling basin for impact sediment control. Develop annual sediment budget for Cache Creek)							X							
20	Cache Creek Settling Basin Clean-up: pilot implementation program, and demonstration							X							
21	Implementation of alternative land management programs intended to convert agricultural lands to uses such that they will not discharge subsurface drain or tail water to natural or constructed waterways and utilize constructed vegetated channels to remove selenium from agricultural drain water											X			
22	Reduction in pesticide inputs, nutrient inputs, and erosion and sediment control in winegrape vineyards by implementing BMPs via a grower self-assessment program							X	X	X		X			

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23	Implementation of discharge permit and control system intended to allow access to district drainage system only if drainwater meets District standards											X		
24	Pilot implementation projects of methyl-mercury control in different settings (i.e. wetland and agriculture drains)						X	X			X	X	X	
25	Mine Clean-Up pilot implementation project of an ongoing source of mercury to address off-site migration of mercury			X	X			X	X	X		X		X
26	Implementation and evaluation of BMPs to address low dissolved oxygen conditions in the lower San Joaquin River												X	
27	Implementation and evaluation of BMPs for the Bay-Delta Mercury Control Program						X	X					X	
28	Implement irrigation improvement projects to reduce water use.	X			X		X	X	X	X	X	X	X	X
29	Projects which improve upland conditions (i.e. fuels management, wildlife habitat enhancement, range improvement, etc.) and result in improved water quality and aquatic habitat conditions	X	X	X	X			X	X	X		X	X	X
30	Revegetation of banks of waterways and irrigation canals to reduce sedimentation and buffer other NPS pollution, including use of native flora.	X	X	X	X	X	X	X	X	X	X	X	X	X
31	Projects which result in augmentation of in-stream flows for purposes of enhancing water quality, fisheries, aquatic habitat and other beneficial water uses	X	X	X	X	X	X	X	X	X	X	X	X	X
32	Implementation of stream restoration measures to restore and protect fish habitat and passage. Including the construction of fish barriers/screens and restoration of	X	X	X	X	X	X	X	X	X	X	X	X	X

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42	Projects which develop/implement individual watershed management strategies within the overall Upper Feather River Basin (e.g. Spanish Creek, Indian Creek, Sulfur Creek, Sierra Valley, etc.)		X											
43	Projects which contribute to the implementation of the Diazinon TMDL for the Sacramento River					X					X			
44	Projects which address the 303(d) listing for Chlorpyrifos, Copper, Organic Enrichment/Low D.O., Boron, E.C., and/or Diazinon						X				X	X	X	
45	Projects which address the 303(d) listing for Mercury				X	X	X	X	X	X	X	X	X	
46	Orchard pesticide application equipment: establish standards for evaluation, evaluate efficiencies of available equipment, refine spray parameters to optimize efficiency, develop new equipment using newer technology, technology transfer to growers.	X	X	X	X	X	X		X		X	X	X	
47	Pesticide use profiling. “Mine” PUR to profile use patterns. Determine management regimes used, share information with growers in area.	X	X	X	X	X	X		X		X	X	X	
48	GIS mapping of soils, slopes, distance from waterbody, etc. to identify zones where pesticide runoff is likely and mitigation necessary.	X	X	X	X	X	X		X		X	X	X	
49	Vegetative canals for runoff mitigation.	X	X	X	X	X	X		X		X	X	X	
50	Use existing fields as “treatment systems” for agricultural discharges from other commodities.	X	X	X	X	X	X		X		X	X	X	
51	Fund implementation of BMPs already identified as likely to be effective, quantify effectiveness.	X	X	X	X	X	X		X		X	X	X	
52	Fund projects that can generate revenue and become self-supporting, such as labeling program for WQ protection.	X	X	X	X	X	X	X	X	X	X	X	X	

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	Assess Loadings and Impacts														
53	Projects which support capacity to establish and implement locally directed watershed management programs: including watershed assessments							X	X	X	X	X	X	X	X
54	Projects which assess nutrient source loads in areas of identified beneficial use impacts							X	X	X	X	X	X	X	X
55	Studies that address discharges of mercury and other heavy metals from a variety of sources including abandoned and inactive mines							X	X	X	X	X	X	X	X
56	Projects which assess bacteria contamination in areas of identified beneficial use impacts							X	X	X	X	X			X
57	Evaluate urban subwatersheds and identify significant contaminant sources							X				X			
58	Implementation of a study of the Salt/Boron in the San Joaquin River with a Real-time management infrastructure; will require the establishment of real-time flow and water quality stations at key compliance points in the San Joaquin River												X		
59	Assess high salinity drainage discharges														X
60	Investigate loading impacts from confined animal facilities														X
61	Investigate nitrogen and salt loading contributions to ground and surface water														X
62	Investigate loading contributions from septic systems							X	X	X	X	X			X
63	Investigate loading contributions from agricultural activities														X

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64	TMDL Development														X
65	Projects which identify the source and magnitude of pollutants in urban streams of Redding and Chico, and evaluate the effectiveness of BMPs to address these pollutants				X										
66	Projects which identify the pathogen loadings in waterways sourced from boating marinas						X				X	X	X		
Research-Oriented Studies															
67	Projects which address the transport of pesticides and other pollutants from orchard operations, i.e. identification and measurement of influencing parameters, mass balance studies, and implementation and evaluation of the effect of Best Management Practices for various crops and seasons						X	X	X	X	X	X	X	X	X
68	Transport of pesticides applied in urban areas to surface water bodies: Identification and measurement of influencing parameters, implementation, and evaluation of the effect of Best Management Practices						X				X	X	X	X	X
69	Feasibility studies of mercury control in different settings (i.e. mercury, mine, gold mine, stream bed sediment) and effectiveness monitoring						X	X	X	X	X	X	X	X	X
70	Cache CreekSettling Basin Clean-up: feasibility study							X							
71	Feasibility studies of methyl-mercury control in different settings (i.e. wetland and agriculture drains) with additional satellite studies later						X	X				X	X		
72	Mine Clean-Up feasibility study; would address options for reducing off-site migration of mercury							X	X	X		X	X	X	

Information regarding potential funding sources may be found at the following website: <http://calwatershedfunds.org/index.php>

**Table 2: Targeted Projects, Needs or Activities**

Project Type and Description		Watersheds, Subwatersheds, and Subareas (by Hydrologic Unit Number and Name)												
		505, 506, 525, 526, 527, 562	518	522, 523, 524	507, 509, 521	504, 508	510	512, 513	516, 517	514	511, 515, 519, 520	53x, 541, 542, 542, 543	544	55x
		Northeast Subarea (Pit River, McCloud River, and Upper Sacramento River)	Upper Feather River Subarea (North, Middle/South Forks of Feather River above Lake Oroville)	Westside of Sacramento Valley (Cottonwood, Redbank, Elder, Thomas, and Stony Creek)	North and Eastside Sacramento Valley (Clear, Cow, Bear, Battle, Mill, Deer, Big, Chico, and Butte Creeks)	Sacramento River (Redding to Hamilton City)	Sacramento Delta	Southwest side of Sacramento Valley Subwatersheds	Yuba and Bear River Subwatersheds	American River Subwatershed	Lower Sacramento Valley Floor Subwatersheds (Sacramento River from Hamilton City to I St. Bridge)	San Joaquin River Watershed	San Joaquin Delta	Tulare Lake Watershed
73	Support temperature modeling efforts in the Merced River Watershed											X		
74	Study fate, transport, toxicity of pyrethroids and other pesticides likely to substitute for diazinon, especially in sediment	X	X	X	X	X	X	X	X	X	X	X	X	
75	Larger scale basin monitoring; assess basin-wide impacts and improvements	X	X	X	X	X	X	X	X	X	X	X	X	
76	Determine beneficial use of agricultural drains.	X	X	X	X	X	X		X		X	X	X	
Monitoring														
77	Implementation of monitoring programs which demonstrate effectiveness of practices addressing pollutants from irrigated and non-irrigated agriculture						X	X	X	X	X	X	X	X
78	Implement citizens monitoring						X	X	X	X	X	X	X	X
79	Projects which document existing baseline water quality/watershed condition and establish programs to evaluate long-term water quality/watershed trends.						X	X	X	X	X	X	X	X
80	Assessment of salmonid populations and monitoring of site-specific and cumulative biological response to implementation of conservation/restoration strategies with the goal of restoring and protecting fish habitat and passage						X	X	X	X	X	X	X	X
81	Inventory stream resource conditions and major sediment sources in order to implement stream restoration projects							X	X	X				
82	Develop baseline water monitoring data for future measurement of BMP impacts on NPS pollution reduction in vineyards.							X				X		

Information regarding potential funding sources may be found at the following website: <http://calwatershedfunds.org/index.php>

**Table 2: Targeted Projects, Needs or Activities**

Project Type and Description		Watersheds, Subwatersheds, and Subareas (by Hydrologic Unit Number and Name)													
			505, 506, 525, 526, 527, 562	518	522, 523, 524	507, 509, 521	504, 508	510	512, 513	516, 517	514	511, 515, 519, 520	53x, 541, 542, 542, 543	544	55x
			Northeast Subarea (Pit River, McCloud River, and Upper Sacramento River)	Upper Feather River Subarea (North, Middle/South Forks of Feather River above Lake Oroville)	Westside of Sacramento Valley (Cottonwood, Redbank, Elder, Thomes, and Stony Creek)	North and Eastside Sacramento Valley (Clear, Cow, Bear, Battle, Mill, Deer, Big, Chico, and Butte Creeks)	Sacramento River (Redding to Hamilton City)	Sacramento Delta	Southwest side of Sacramento Valley Subwatersheds	Yuba and Bear River Subwatersheds	American River Subwatershed	Lower Sacramento Valley Floor Subwatersheds (Sacramento River from Hamilton City to I St. Bridge)	San Joaquin River Watershed	San Joaquin Delta	Tulare Lake Watershed
83	Conduct beneficial use impacts monitoring														X
84	Surface water source identification and loading														X
85	Implement biological monitoring														X
86	Create GIS repository for watershed data														X
87	Monitor sedimentation in streams down slope of areas effected by wildfires and timber harvesting														X
88	Conduct pathogen indicator monitoring in and around boating marinas							X				X	X	X	
Education and Outreach															
89	Implement K-12 Watershed education program							X	X	X	X	X	X	X	X
90	Implement public education programs about urban and agricultural recycling programs to reduce demand on freshwater inflows.							X	X	X	X	X	X	X	X
91	Provide educational programs on the California Irrigation Management Information System (CIMIS) database and how it can be utilized to reduce overall water use.							X				X	X	X	X
92	Establish a centralized information service to gather and disseminate information about watershed projects/activities taking place throughout the San Joaquin river basin												X		
93	Support water quality educational initiatives in the Merced River Watershed												X		
94	Septic tank education and outreach								X	X	X				X

Information regarding potential funding sources may be found at the following website: <http://calwatershedfunds.org/index.php>

**Table 2: Targeted Projects, Needs or Activities**

Project Type and Description		Watersheds, Subwatersheds, and Subareas (by Hydrologic Unit Number and Name)													
			505, 506, 525, 526, 527, 562	518	522, 523, 524	507, 509, 521	504, 508	510	512, 513	516, 517	514	511, 515, 519, 520	53x, 541, 542, 542, 543	544	55x
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95	Support for continuation/expansion of the River Center (information/outreach center for the Pit River Watershed)	X													
96	Education and outreach on proper management of domestic wastewater from houseboats						X					X	X	X	
	Watershed Planning														
97	Projects which support capacity to establish and implement locally directed watershed management programs: including development of watershed management plans						X	X	X	X	X	X	X	X	
98	Fund Stakeholder Group Coordinator to facilitate development of watershed management plans						X	X	X	X	X	X	X	X	
99	Develop flow recommendations for anadromous fish passage in the valley sections						X				X	X	X		
100	Develop a control program for subwatersheds of the American River. Control measures may be structural and non-structural controls (e.g., community/business outreach, storm drain stenciling, etc.).									X					
101	Assist in development of nutrient reduction plans for surface waters							X					X	X	
	Land Acquisition														
102	Protection, restoration, and enhancement of sensitive watershed lands through easement/fee title acquisitions and other means to avoid or reduce water quality impacts from encroaching land uses						X	X	X	X	X	X	X	X	

Information regarding potential funding sources may be found at the following website: <http://calwatershedfunds.org/index.php>

## **APPENDIX 2 – NONPOINT SOURCE PROGRAM**

## Nonpoint Source Program

Nonpoint source pollution is the leading cause of water quality impairment in California. California's Nonpoint Source (NPS) Pollution Control Program has been in effect since 1988. In 2000 the lead State agencies for the NPS Program, the SWRCB and CCC in coordination with the RWQCBs, released the "Plan for California's Nonpoint Source Pollution Control Program" (NPS Program Plan). The NPS Program Plan enhances the State's efforts to protect water quality, and to conform to the Clean Water Act Section 319 (CWA 319) and Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). The State's long-term goal is to "improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013." A key element of the Program is development and implementation of five-year plans that cover State Fiscal Years 1998-2003, 2003-2008, and 2008 –2013.

The California Nonpoint Source Program encompasses more programs than the activities funded through the federal nonpoint source program resources. The following describes the Regional Board's activities within each of the NPS Program Management Measures.

*Management Measure 1A: Erosion and Sediment Control:* Sediment from irrigated agriculture and other land uses are seriously impacting water quality in the valley floor tributaries and mainstream channels. These impacts include burial of habitat and input of pesticides attached to the sediment. Generally funded by the federal nonpoint source resources, initial efforts have begun in several tributaries but staff time is not available to work with local groups to promote and expand this effort.

*Management Measure 1B: Confined Animal Facilities Wastewater and Runoff:* There are 1702 dairies operating in the Central Valley: 202 dairies are in the Sacramento River watershed, more than 900 dairies are in the San Joaquin River watershed with over 600,000 milk cows, and more than 600 dairies are in the Tulare Lake watershed with around 500,000 milk cows. There are also 400 additional confined animal facilities for other large, non-dairy animals. The waste production at each dairy is equivalent to a small city. Dairy wastes contain ammonia, salts, and pathogens that threaten surface water quality in the event of a direct discharge to surface waters. Nitrates and salts also pose a serious groundwater threat. The majority of these facilities are not regulated by waste discharge requirements. Based on information obtained during compliance inspections, complaint investigations, and aerial surveillance flights, it is apparent that many of the facilities are following practices that may adversely impact both surface and ground water quality. Several drains and creeks on the eastside of the San Joaquin River have documented seasonal water quality degradation due to discharges from dairies. Lone Tree Creek and Temple Creek are both included on the 1998 Clean Water Act 303(d) list for low dissolved oxygen and elevated levels of ammonia. Leached wastes from corrals, retention ponds, manure storage, silage storage, and application on farmland threatens to degrade groundwater.

For almost 30 years the Regional Board has maintained a baseline program to address these problems. Although program elements include inspections, responding to complaints, adopting requirements and taking enforcement actions, resources were not available to adequately conduct these tasks. Because of the backlog of violations, most effort is devoted to documentation and enforcement of violations; therefore, little time is devoted to review and approval of new or expanded dairy facilities to assure

compliance with regulations and minimize the potential for additional surface water and ground water quality problems. There are large backlogs of reports of waste discharge and waste discharge requirement updates that are not being addressed. Recently, the regulation of runoff from dairies has been included in the general storm water permit program.

Formation of the Dairy Enforcement Task Force, composed of representatives from the attorney general's office, the US attorney's office and the county district attorney's office, has helped address regulation of noncompliant dairy operations. When all other efforts at controlling nonpoint source pollution from dairy wastes fail, the Regional Board will pursue legal prosecution of the responsible parties. Increased staffing in the Confined Animal Facility Unit (CAF Unit) has nearly doubled the number of cases being taken to the Dairy Enforcement Task Force.

Several counties in the Central Valley do not issue to dairies the types of permits that trigger the development of environmental assessments under the California Environmental Quality Act (CEQA). In these counties, the Regional Board becomes the CEQA lead agency if it is determined that waste discharge requirements (WDRs) are needed for a dairy. Increasing the difficulty of protecting the state's waters from these operations, recent CEQA documents, generated via litigation, have identified concerns that state standards for animal waste holding ponds may not adequately protect groundwater. Staff is working to complete a groundwater study at selected dairies to evaluate the effectiveness of current waste system design and operation to protect ground water quality. Following completion and public review of the report, staff will need to develop recommendations for improvements in dairy facility design and waste management. US EPA and Congress have a number of proposals that would change the federal regulations concerning animal confinement facilities. Some of the proposed changes could have a profound impact on regulation of confined animal facilities and could become a significant unfunded workload.

Confined animal operations have been identified as one of the most significant water quality problems in the State and the situation is getting worse as additional dairies are built and older dairies expanded. To add to the problem, the number of cows per dairy is increasing; some facilities operate with over 10,000 cows per facility. In addition to resource needs for addressing the surface water issues, resources are also needed to form a separate Confined Animal Facility Unit to address ground water issues.

Currently, there is about 10 PYs per year working with confined animal facilities. To conduct the necessary work, an additional 107 PYs per year are needed.

*Management Measure 1C: Nutrient Management:* The USGS has defined nitrate in groundwater as the most serious groundwater problem in the San Joaquin Valley. It is also a serious concern throughout the Central Valley. As all of these groundwater resources represent water supplies designated for domestic and municipal use, loss of them would be a serious impact on surface water supplies that will be needed to replace them. Land use activities and disposal activities under dairies, irrigated agriculture, commercial nurseries, nursery growing areas, and septic tank use areas are producing very high nitrate areas that are impacting domestic and municipal water supplies.

In addition to needing resources for developing a policy for controlling nitrate sources, resources are also needed to work with counties, agricultural organizations, California Fertilizer Association, dairy and other animal associations and others to reduce nitrate loading, develop best management practices and develop long term management plans to protect these water supplies. This work would require 1.0 PY, annually, for several years.

*Management Measure 1D: Pesticide Management:* In the Central Valley, the two largest pesticide issues has been the rice herbicide program and the organophosphate (OP) pesticide control efforts.

A multi-agency program on rice drainage to reduce off-site movement of pesticides has been effective in significantly reducing toxicity and the levels of rice pesticides reaching surface waters. Because of this successful program, the Sacramento River has been removed from the Clean Water Act Section 303(d) list for the rice pesticides. Current levels of monitoring, however, are not adequate to fully characterize the success of the program. In addition, some of the original rice pesticides have been replaced with other chemicals that have not been evaluated to determine their environmental effects. More monitoring is needed. Staff needs to continue to evaluate the program. Moreover, the Regional Board has committed to developing water quality objectives for five pesticides (carbofuran, malathion, methyl parathion, molinate, and thiobencarb) used on rice fields. However, the Board lacks the funds to conduct the necessary work and carry out a basin plan amendment. It is estimated that this work would require 0.5 PYs per year to evaluate existing information to develop appropriate water quality objectives. After that, 1.0 PYs will be needed to administer a basin plan amendment.

The OP pesticides diazinon and chlorpyrifos have been documented at toxic levels in the San Joaquin River, Sacramento River, Feather River, Delta, and other smaller water bodies. All of these water bodies have been included in the Clean Water Act Section 303(d) list of impaired water bodies. Regional Water Board staff is working with the Department of Pesticide Regulation, stakeholder groups, industry representatives, the various commodity Boards, the pesticide registrants and environmental groups to support efforts to develop management practices to reduce the levels of the pesticides reaching surface waters. CALFED has funded numerous projects directed toward development of these practices in agricultural and urban settings. Additional Calfed resources have been allocated to address questions about the ecological significance of observed levels of pesticides in and around the Delta. The Department of Fish and Game has completed their work on criteria for chlorpyrifos and diazinon. In the San Joaquin River, the loads and sources of pesticides have been well defined during drought periods. More information is still needed in the Delta and Sacramento River watershed.

Staff is currently compiling the information necessary to develop control programs for diazinon in the Sacramento and Feather Rivers and diazinon and chlorpyrifos in the San Joaquin River. Because this is a high priority activity, the resources allocated from the TMDL program (6 PYs to work on the Sacramento and San Joaquin Rivers and the urban streams in Sacramento and 1 PYs to work on the Delta) are sufficient to complete the development of these TMDLs.

A serious problem is presented with pesticides in ground water. In the Sacramento River Watershed, pesticides have impacted more than 30 square miles of ground water. Bentazon has been found in wells in Glenn, Colusa, Sutter, Yolo, and Yuba Counties, as have other pesticides, but to a lesser degree.

Elevated levels of pesticides, including Dibromochloropropane (DBCP) and Ethylene Dibromide (EDB) affect more than 1000 square miles of groundwater in the San Joaquin Valley. Most of the problem occurs in the Kings Basin (in the vicinity of Fresno). The source of DBCP is past applications. Pesticide contamination from past applications should be studied and management practices to reuse the residues and protect drinking water supplies should be developed. However, no staff resources are allocated to address this issue.

*Management Measure 1E: Grazing:* Cattle grazing in the upper basins of all three watersheds is impacting beneficial uses and riparian habitat by increasing sediment production, altering temperatures, and adding bacterial contamination. As many of these watersheds represent critical habitat for cold water species, it is essential to work with the cattle industry, University of California and others to increase the use of BMPs to protect these waters. Currently 1.0 PY is provided from federal nonpoint source program resources to work with the UC Cooperative Extension in their rangeland management program.

*Management Measure 1F: Irrigation Water Management:* The greatest threat to water quality in the Central Valley is the slow and gradual increase in salinity in the groundwater, especially in the Tulare Lake Basin and the San Joaquin River Basin. Previously, this was thought to be a problem associated with irrigated agriculture, especially drainage problem areas. Now the issue extends to all types of land uses, water uses and to point source dischargers. Long-term management options and loading alternatives need to be assessed. The nonpoint source program should be a catalyst to initiate such a program. Currently, there are no resources allocated for this task, 1.0 PYs are needed to assess this problem and develop a suitable scope of work.

*Management Measure 2: Forestry:* Forestry activities have the potential to cause water quality impairments due to temperature, sediment and siltation, and herbicides. Activities that cause problems include road construction, water crossings, harvesting, and application of herbicides. Staff works with the California Department of Forestry in the Timber Harvest Plan review process. This should include attending review team meetings, participating in pre-harvest inspections, and making recommendations to protect water quality. However, Region 5 is only allocated 2.2 PYs to address all forestry issues on Federal and private lands and this hardly allows Region 5 staff to review 10 percent of the timber harvest plans (THPs) submitted for private lands and leaves no resources for review of harvesting activities on USFS or BLM lands. Timber harvest plans often are prepared with questionable practices that are nevertheless approved to keep the plan “feasible”, as defined by the Board of Forestry (BOF). Staff resource limitations do not allow “on-the-ground” review of most planned operations. Although buffer zones on anadromous streams have been increased, other streams (non-fish-bearing streams) are not included. On these streams, buffers remain too narrow to protect water quality. The Department of Fish and Game (DFG) has received staff increases for review of fishery streams. Although their review is limited to endangered species, it does provide some, though very limited, review of water quality issues. Road construction, maintenance and decommission continue to be major water quality problems. Small landowners have limited choices to locate roads due to property boundary constraints and there is confusion regarding acceptable methods to calculate 100-year floods, negating much of the benefit of recently adopted rules requiring 100-year design flow. In addition, the new requirements for crossings will require bridge installations that will be expensive for small landowners, potentially leading to

increased violations. Region 5 staff lack resources to review THPs for implementation of this rule. Mechanical preparation of areas for forest rehabilitation continues to have significant water quality impacts. Tractors continue to be used on steep slopes, particularly in economically marginal situations. Increased field review would lead to fewer such situations. In addition, emergency operations following wildfires have significant impacts and there are no requirements for replanting or environmental review. Since THPs are not required to specify the type of vegetative controls used in connection with the harvest operation, the Regional Board has no way of knowing when water quality is threatened from herbicide sprays, particularly non-restricted herbicide sprays, unless the Department of Pesticide Regulation provides project review.

Cumulative impact analysis within watersheds should be coordinated by CDF. Resources should be used to develop databases of beneficial uses, projects and impacts within watersheds that could be accessed by foresters for preparing THPs. Training in acceptable methods for calculating 100-year flood flows and for acceptable crossing design also should be provided. A THP requirement to identify roads near Watercourse and Lake Protection Zones (WLPZs) and Equipment Limitation Zones (ELZs) would assist plan review. Provision of adequate staff to evaluate and document road maintenance successes and failures would result in the development of information and training for foresters, timber operators, landowners and agencies that could preclude future NPS problems.

To address our inability to review most THPs submitted to CDF for private lands, Regional Board staff now sends a letter to CDF to be placed in the THP file stating that we have not reviewed the THP in question. The letter further states that CDF approval of the THP without Regional Board review may constitute non-compliance with CEQA and the Forest Practices Act.

The Regional Board in January 2001 unanimously passed a resolution directing the Executive Officer “to investigate all possible means to obtain supplemental resources, including redirection...and to request resources from the State Water Resources Control Board if necessary”. A BCP requesting additional resources as well as a PCP requesting a redirection of existing resources have been submitted to the State Board. Although the outcome of these requests is unknown, it is unlikely that this Region will receive significant new staff resources to address forestry issues. This program will continue to be severely under funded.

In order to adequately provide reviews for timber harvest plans including conducting pre-harvest and post-harvest inspections, the resources would need to be increased by an additional 20 PYs per year.

*Management Measure 3.1, 3.2 and 3.3: Runoff from Developing Areas, Construction Sites and Existing Development:* Runoff from municipalities with a population greater than 100,000, construction that disturbs 5 acres or more, and most industrial activities is addressed through Phase I of the Storm Water Regulatory Program. Phase II of the Storm Water Regulatory Program begins implementation in March 2003. In Phase II, municipalities with a population greater than 10,000 and construction that disturbs 1 acre or more will be regulated. Until Phase II is fully implemented, the separation between the regulatory program and the nonpoint source program is not fully understood.

*Management Measure 3.4: On-site Disposal Systems:* Improperly regulated on-site systems pose a significant threat to water quality and public health. The Regional Board has the legal responsibility to regulate individual wastewater treatment and disposal systems. The Board has delegated program implementation authority to each County that adopts an ordinance and develops a program consistent with the on-site disposal guidelines in the Basin Plans. Unfortunately, for approximately the last fifteen years there have not been adequate resources to review and approve the 38 County ordinances as directed by the Basin Plan. The Basin Plan guidelines are over 25 years old and are in need of review and update.

Recent legislation (Section 13291 of the California Water Code) requires the State Board to adopt regulations or standards for the permitting and operation of onsite sewage treatment systems by 1 January 2004. The State Board has formed advisory groups to help develop these regulations. Regional Board staff is participating in the advisory groups. 0.1 PYs of regulatory resources have been directed at this effort.

*Management Measure 4.1G: Sewage Facility for Marinas and Recreational Boating:* There are numerous boats in the Delta, rivers, and lakes in the Region. Many are used recreationally, but some are used as permanent living quarters. Large lakes such as Lake Shasta have prohibitions against sewage discharges from boats so sewage must be stored on board for later disposal at a pump-out facility. For other waters, discharges are supposed to be through an approved Marine Sanitation Device or also stored on board. From complaints and general experience, we are aware that sewage from some boats is discharged to open waters. There are numerous boats in the Delta used as permanent housing which are not hooked to sewers and are incapable of moving to a pumpout facility, so are likely discharging sewage to surface waters. Untreated sewage discharges are a health threat and cumulatively may be a significant BOD and nutrient load in some waters. Staff time is needed to evaluate the threat and work with other agencies (Coast Guard, health departments, and Department of Boating and Waterways) and marinas to assure adequate pumpout facilities are available and illegal discharges of sewage are stopped. Estimated staff time to develop a scope of work for this issue is 0.3 PYs.

*Management Measure 5: Hydromodification:* The State and Regional Boards regulate waste discharges from hydromodification activities through the Water Quality Certification program. This program has allocated funding and is described separately.

Habitat protection and improvement also fall under this management measure. Major efforts are being undertaken by CALFED, the Governor's Watershed Protection Council and others to restore cold water migration routes and habitat for endangered species. While many of these groups are working on habitat improvement, a major impact that is not addressed is warm water return flows from urban runoff, agriculture and other types of land use. An additional 2.0 PYs are needed to characterize and control these discharges.

*Management Measure 6: Wetlands, Riparian Areas and Vegetated Treatment Systems:* The Regional Board has the authority to regulate activities affecting wetlands under both State and federal law through the Water Quality Certification program. This program has allocated funding and is described separately.

Wetlands are unique systems that the Regional Board has not fully evaluated. The following are the long-term goals for protecting wetlands within Central Valley:

- Support projects that ensure no overall net loss and achieve a long-term net gain in the quantity and quality, and permanence of wetlands acreage and values in California in a manner that fosters creativity, stewardship and respect for private property (California Wetlands Conservation Policy, Executive Order W-59-93)
- Encourage partnerships to make landowner incentive programs and cooperative planning efforts the primary focus of wetland conservation and restoration
- Encourage the use of appropriate management measures and best management practices for wetlands protection, enhancement, restoration, or creation
- Promote improved public awareness and education

At present, the Regional Board does not have a wetlands policy; staff assists individuals with proposals for CWA wetlands grants. A wetlands program for the Central Valley needs to be developed and implemented. An additional 2.0 PYs will be needed to:

- Evaluate wetlands as a beneficial use to be used in the Basin Plan
- Perform wetlands inventory for the region
- Support stakeholder activities that work to preserve and enhance wetlands

*Abandoned mines:* Although not one of the NPS Management Categories, abandoned mines and resource extraction activities impact waters in the Region. There are more than 50 identified abandoned mines in the Region, many with adit flows or runoff through tailings or process wastes which result in discharges to surface waters. Mines with responsible parties are regulated under the NPDES Program. Other work on mines is conducted in conjunction with other programs such as TMDLs. An unfounded priority is to assess the relative impacts of the various discharges on surface waters to develop a priorities for staff work. Work is also needed to develop discharge standards and evaluate various treatment/remediation alternatives. Estimated staff time: 1.8 PYs.

## **APPENDIX 3 – MONITORING**

Table 1 – Contract Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Contract Needs (Thousands \$)								
		FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
<b>REGIONWIDE</b>										
<b>Ag Dominated Water Bodies (Bioassessment)</b>	(A)									
Sacramento Basin			\$100				\$100			\$100
San Joaquin Basin/Delta	(B)		\$223			\$273				
<b>Subtotal:</b>		<b>\$0</b>	<b>\$323</b>	<b>\$0</b>	<b>\$0</b>	<b>\$273</b>	<b>\$100</b>	<b>\$0</b>	<b>\$0</b>	<b>\$100</b>
<b>Effluent Dominated Water Bodies</b>	(A)	\$75			\$75					
<b>Citizen Monitoring</b>										
Support citizen monitoring programs				\$150			\$150			\$150
<b>Pathogens/Bacteria</b>										
Baseline	(A), (C)	\$9	<i>b</i>	\$41			\$50			
Source Identification	(C), (D), (E)	\$11	<i>b</i>	\$89			\$100			
<b>Subtotal:</b>		<b>\$95</b>	<b>\$0</b>	<b>\$280</b>	<b>\$75</b>	<b>\$0</b>	<b>\$300</b>	<b>\$0</b>	<b>\$0</b>	<b>\$150</b>
<b>Regionwide Study Total:</b>		<b>\$95</b>	<b>\$323</b>	<b>\$280</b>	<b>\$75</b>	<b>\$273</b>	<b>\$400</b>	<b>\$0</b>	<b>\$0</b>	<b>\$250</b>
<b>SACRAMENTO RIVER BASIN</b>										
<b>Main Stem Sacramento River</b>										
SRWP multi-agency monitoring effort	(F)		\$300	\$200			\$500			\$500
<b>Feather River Watershed Monitoring</b>	(A)	\$78								\$100
<b>Pit River Watershed Monitoring</b>	(A)	\$98								
<b>Lake Siskiyou Watershed Monitoring</b>	(A)	\$16								
<b>Watershed Monitoring - Rotational Monitoring of N. Sac. R. basins</b>	(A)			\$400			\$400			\$400
<b>Sacramento River Basin Total:</b>		<b>\$192</b>	<b>\$300</b>	<b>\$600</b>	<b>\$0</b>	<b>\$0</b>	<b>\$900</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,000</b>

Table 1 – Contract Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Contract Needs (Thousands \$)								
		FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
<b>SAN JOAQUIN RIVER BASIN</b>										
<b>Student Interns</b>	(A), (G)	\$105		\$50			\$155			\$155
Field work; data management										
<b>Selenium/Salt/Boron Program</b>	(A), (G), (H), (I), (J), (K), (L)	\$138	<i>b</i>				\$140			\$140
Maintain multi-agency monitoring effort										
<b>Real Time Monitoring Program</b>	(A), (G), (H), (I), (J), (K), (L)	\$47	<i>b</i>				\$50			\$50
Coordinate saline/fresh water releases										
<b>Main Stem San Joaquin River</b>	(A), (C), (H), (L), (M)	\$74	<i>b</i>	\$20			\$100			\$100
Evaluate water quality downstream of major inflows										
<b>Drainage Basin Inflows to the SJR</b>	(A), (C), (H), (L), (M)	\$180	<i>b</i>	\$67			\$250			\$250
Evaluate water quality of representative discharges from eight major basins drainage to the SJR										
<b>Storm Events</b>		\$0		\$130			\$130			\$130
Document water quality impacts during two major storm events in the river and representative drainage basins inflows										
<b>Baseline for Future Urban Creeks</b>		\$24		\$15			\$40			\$40
Document condition in Mountain House Creek prior to land use conversion from rural habitat to a city of 55,000 people										
<b>Fresno River</b>										
Nutrient Monitoring				\$25			\$25			\$25
<b>Rotational Basin Monitoring</b>	(A), (C), (H), (L), (M), (N)	\$29	<i>b</i>	\$191			\$220			\$220
Intensive monitoring in major drainage basins once every 5- yrs										
<b>Abandoned Mines</b>				\$11			\$11			\$11
Evaluate possible Hg impacts from placer deposits and abandoned mines in Sierra Nevada and Coast Range										
<b>Grazing/Timber Harvest</b>				\$11			\$11			\$11

Table 1 – Contract Needs

		Contract Needs (Thousands \$)								
WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
Evaluate sediment loading and other habitat impacts										
<b>Citizen Monitoring</b>				\$150			\$150			\$150
Initiate citizen monitoring network similar to that formed in the Sacramento Watershed										
<b>San Joaquin River Basin Total:</b>		<b>\$597</b>	<b>\$0</b>	<b>\$670</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,282</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,282</b>
<b>SACRAMENTO-SAN JOAQUIN DELTA</b>										
<b>Evaluation of Group A Pesticide Fish Tissue Levels</b>										
Chemically analyze backlog of fish tissue samples				\$100						
Central Valley Fish Consumption study <sup>c</sup>				\$1,000			\$1,000			\$1,000
Central Valley Fish Body Burden Study <sup>f</sup>				\$500			\$1,000			\$1,000
Assess human and wildlife hazard of consuming fish										
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$1,600</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,000</b>
<b>MTBE</b>										
Monitor to determine sources, concentrations and risk to Bene. Use		\$20		\$50			\$50			\$50
Assemble inventory of BMPs for problem control							\$20			\$20
Evaluate feasibility of implementing promising BMPs										
<b>Subtotal:</b>		<b>\$20</b>	<b>\$0</b>	<b>\$50</b>	<b>\$0</b>	<b>\$0</b>	<b>\$70</b>	<b>\$0</b>	<b>\$0</b>	<b>\$70</b>
<b>Back Slough Toxicity</b>										
Determine magnitude, duration, extent, chemical cause and source				\$200			\$200			\$200
Assemble inventory of BMPs to correct problem							\$50			\$50

Table 1 – Contract Needs

		Contract Needs (Thousands \$)								
WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
Evaluate feasibility of implementing promising BMPs										
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$200</b>	<b>\$0</b>	<b>\$0</b>	<b>\$250</b>	<b>\$0</b>	<b>\$0</b>	<b>\$250</b>
<b>Back Slough Low Dissolved Oxygen Levels</b>										
Continue to assess chemical cause and magnitude of problem				\$200			\$200			\$200
Assemble inventory of BMPs to correct Problem							\$70			\$70
Evaluate feasibility of implementing promising BMPs										
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$200</b>	<b>\$0</b>	<b>\$0</b>	<b>\$270</b>	<b>\$0</b>	<b>\$0</b>	<b>\$270</b>
<b>PCBs and Dioxins</b>										
Central Valley Fish Consumption Study <sup>c</sup>				\$1,000			\$1,000			\$1,000
Central Valley Fish Body Burden Study <sup>c</sup>				\$500			\$1,000			\$1,000
Determine sources of dioxins										
Assess human and wildlife hazard of consuming fish										
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$1,500</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2,000</b>
<b>Sacramento-San Joaquin Delta Totals:</b>		<b>\$20</b>	<b>\$0</b>	<b>\$3,550</b>	<b>\$0</b>	<b>\$0</b>	<b>\$4,590</b>	<b>\$0</b>	<b>\$0</b>	<b>\$4,590</b>
<b>TULARE LAKE BASIN</b>										
<b>Kings River, Upper (Ten Mile Creek)</b>										
Monitor algal bloom problems near Cedar Grove <sup>(A)</sup>			\$7	\$19			\$25			\$25
Monitor foaming problems in Ten Mile Creek <sup>(A)</sup>			\$6	\$18			\$25			\$25
<b>Subtotal:</b>		<b>\$0</b>	<b>\$13</b>	<b>\$37</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>
<b>Kings River, Lower</b>										

Table 1 – Contract Needs

		Contract Needs (Thousands \$)								
WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
Assess high salinity drainage discharges				\$10			\$10			\$10
Feasibility studies to reduce salinity				\$50			\$50			\$50
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$60</b>	<b>\$0</b>	<b>\$0</b>	<b>\$60</b>	<b>\$0</b>	<b>\$0</b>	<b>\$60</b>
<b>Kaweah River - including Lake Kaweah</b>										
Assess bacteria problems	(A)		\$15	\$35			\$50			\$50
<b>Subtotal:</b>		<b>\$0</b>	<b>\$15</b>	<b>\$35</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>
<b>Tule River - including Lake Success</b>										
Assess water quality	(A)		\$15	\$35			\$50			\$50
<b>Subtotal:</b>		<b>\$0</b>	<b>\$15</b>	<b>\$35</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>
<b>Kern River - including Lake Isabella</b>										
Assess water quality	(A)		\$15	\$35			\$50			\$50
<b>Subtotal:</b>		<b>\$0</b>	<b>\$15</b>	<b>\$35</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>	<b>\$0</b>	<b>\$0</b>	<b>\$50</b>
<b>MTBE</b>										
Monitor to determine sources, concentrations and risk to										
Beneficial Uses in Recreational Boating Reservoirs				\$15			\$15			\$15
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$15</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15</b>
<b>Panoche Creek</b>										
Assess extent of mercury, selenium, and sedimentation				\$5			\$5			\$5
Evaluate feasibility of implementing BMPs										\$10
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$5</b>	<b>\$0</b>	<b>\$0</b>	<b>\$5</b>	<b>\$0</b>	<b>\$0</b>	<b>\$15</b>
<b>San Carlos Creek</b>										
Assess extent of mercury contamination				\$2			\$2			\$2
Evaluate feasibility of implementing BMPs										\$10
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$2</b>	<b>\$0</b>	<b>\$0</b>	<b>\$2</b>	<b>\$0</b>	<b>\$0</b>	<b>\$12</b>
<b>Mendota Pool</b>										
Assess water quality of groundwater pumped into it				\$12			\$12			\$12

Table 1 – Contract Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Contract Needs (Thousands \$)								
		FY01/02			FY02/03			FY03/04		
		Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded	Funded (Reg. Bd.)	External Funding <sup>a</sup>	Unfunded
Assess salt loading from flows to the San Joaquin River				\$10			\$10			\$10
Assess loading of salt and trace elements in releases to the wildlife refuge				\$5			\$5			\$5
<b>Subtotal:</b>		<b>\$0</b>	<b>\$0</b>	<b>\$27</b>	<b>\$0</b>	<b>\$0</b>	<b>\$27</b>	<b>\$0</b>	<b>\$0</b>	<b>\$27</b>
<b>Tulare Lake Basin Total:</b>		<b>\$0</b>	<b>\$58</b>	<b>\$251</b>	<b>\$0</b>	<b>\$0</b>	<b>\$309</b>	<b>\$0</b>	<b>\$0</b>	<b>\$329</b>
<b>Regionwide Study Total:</b>		\$95.00	\$323.00	\$280.00	\$75.00	\$273.00	\$400.00	\$0.00	\$0.00	\$250.00
<b>Sacramento River Basin Total:</b>		\$192.00	\$300.00	\$600.00	\$0.00	\$0.00	\$900.00	\$0.00	\$0.00	\$1,000.00
<b>San Joaquin River Basin Total:</b>		\$597.00	\$0.00	\$670.00	\$0.00	\$0.00	\$1,282.00	\$0.00	\$0.00	\$1,282.00
<b>Sacramento-San Joaquin Delta Totals:</b>		\$20.00	\$0.00	\$3,550.00	\$0.00	\$0.00	\$4,590.00	\$0.00	\$0.00	\$4,590.00
<b>Tulare Lake Basin Total:</b>		\$0.00	\$58.00	\$251.00	\$0.00	\$0.00	\$309.00	\$0.00	\$0.00	\$329.00
<b>CENTRAL VALLEY MONITORING PROGRAM TOTAL:</b>		<b>\$904</b>	<b>\$681</b>	<b>\$5,351</b>	<b>\$75</b>	<b>\$273</b>	<b>\$7,481</b>	<b>\$0</b>	<b>\$0</b>	<b>\$7,451</b>

<sup>a</sup> External funding is listed as known. Subtotals and totals in this column only represent a portion of external funds.

<sup>b</sup> Expenditures by cooperating agencies unknown

<sup>c</sup> Same study as is being identified in the group A pesticide work

(A) Surface Water Ambient Monitoring Program (SWAMP)

(B) OP Pesticide TMDL

(C) UC Davis

(D) Drinking Water

(E) Cooperative Extension

(F) Sacramento River Watershed Program (SRWP)

(G) GBP

(H) U.S. Fish and Wildlife Service (USFWS)

(I) GAF

(J) CA Department of Fish and Game (DFG)

(K) USBR

(L) U.S. Geological Survey (USGS)

(M) CALFED

(N) East Bay Municipal Utilities District (EBMUD)

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
<b>REGIONWIDE</b>							
<b>Ag Dominated Water Bodies (Bioassessment)</b>	(A)		1.0		1.0		1.0
Sacramento Basin							
San Joaquin Basin/Delta	(B)						
<b>Subtotal:</b>		<b>0.0</b>	<b>1.0</b>	<b>0.0</b>	<b>1.0</b>	<b>0.0</b>	<b>1.0</b>
<b>Effluent Dominated Water Bodies</b>	(A)	0.2			0.2		
<b>Citizen Monitoring</b>							
Support citizen monitoring programs			1.0		1.0		1.0
<b>Pathogens/Bacteria</b>		0.5	0.5	0.5	0.5		0.5
Baseline	(A), (C)						
Source Identification	(C), (D), (E)						
<b>Subtotal:</b>		<b>0.7</b>	<b>1.5</b>	<b>0.5</b>	<b>1.7</b>	<b>0.0</b>	<b>1.5</b>
<b>Regionwide Study Total:</b>		<b>0.7</b>	<b>2.5</b>	<b>0.5</b>	<b>2.7</b>	<b>0.0</b>	<b>2.5</b>
<b>SACRAMENTO RIVER BASIN</b>							
<b>Main Stem Sacramento River</b>		0.1	0.1		0.2		0.2
SRWP multi-agency monitoring effort	(F)						
<b>Feather River Watershed Monitoring</b>	(A)						
<b>Pit River Watershed Monitoring</b>	(A)						
<b>Lake Siskiyou Watershed Monitoring</b>	(A)						
<b>Watershed Monitoring - Rotational Monitoring of N. Sac. R. basins</b>	(A)		1.5		1.5		1.5
<b>Sacramento River Basin Total:</b>		<b>0.1</b>	<b>1.6</b>	<b>0.0</b>	<b>1.7</b>	<b>0.0</b>	<b>1.7</b>

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
<b>SAN JOAQUIN RIVER BASIN</b>							
<b>Student Interns</b>	(A), (G)						
Field work; data management							
<b>Selenium/Salt/Boron Program</b>	(A), (G), (H), (I), (J), (K), (L)	1.8	0.2	1.8	0.2	1.8	0.2
Maintain multi-agency monitoring effort							
<b>Real Time Monitoring Program</b>	(A), (G), (H), (I), (J), (K), (L)		1.0		1.0		1.0
Coordinate saline/fresh water releases							
<b>Main Stem San Joaquin River</b>	(A), (C), (H), (L), (M)		0.2		0.2		0.2
Evaluate water quality downstream of major inflows							
<b>Drainage Basin Inflows to the SJR</b>	(A), (C), (H), (L), (M)		0.3		0.3		0.3
Evaluate water quality of representative discharges from eight major basins drainage to the SJR							
<b>Storm Events</b>			0.2		0.2		0.2
Document water quality impacts during two major storm events in the river and representative drainage basins inflows							
<b>Baseline for Future Urban Creeks</b>			0.2		0.2		0.2
Document condition in Mountain House Creek prior to land use conversion from rural habitat to a city of 55,000 people							
<b>Fresno River</b>			0.1		0.1		0.1
Nutrient Monitoring							
<b>Rotational Basin Monitoring</b>	(A), (C), (H), (L), (M), (N)		1.0		1.0		1.0
Intensive monitoring in major drainage basins once every 5- yrs							
<b>Abandoned Mines</b>			0.5		0.5		0.5
Evaluate possible Hg impacts from placer deposits and abandoned mines in Sierra Nevada and Coast Range							
<b>Grazing/Timber Harvest</b>			0.5		0.5		0.5

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
Evaluate sediment loading and other habitat impacts							
<b>Citizen Monitoring</b>			0.3		0.3		0.3
Initiate citizen monitoring network similar to that formed in the Sacramento Watershed							
<b>San Joaquin River Basin Total:</b>		<b>1.8</b>	<b>4.5</b>	<b>1.8</b>	<b>4.5</b>	<b>1.8</b>	<b>4.5</b>
<b>SACRAMENTO-SAN JOAQUIN DELTA</b>							
<b>Evaluation of Group A Pesticide Fish Tissue Levels</b>			0.3		0.3		0.3
Chemically analyze backlog of fish tissue samples							
Central Valley Fish Consumption study <sup>c</sup>							
Central Valley Fish Body Burden Study <sup>c</sup>							
Assess human and wildlife hazard of consuming fish							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>
<b>MTBE</b>			0.5		0.5		0.5
Monitor to determine sources, concentrations and risk to Bene. Use							
Assemble inventory of BMPs for problem control							
Evaluate feasibility of implementing promising BMPs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>
<b>Back Slough Toxicity</b>			0.3		0.3		0.3
Determine magnitude, duration, extent, chemical cause and source							
Assemble inventory of BMPs to correct problem							

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
Evaluate feasibility of implementing promising BMPs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>
<b>Back Slough Low Dissolved Oxygen Levels</b>			0.3		0.3		0.3
Continue to assess chemical cause and magnitude of problem							
Assemble inventory of BMPs to correct Problem							
Evaluate feasibility of implementing promising BMPs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>
<b>PCBs and Dioxins</b>			0.5		0.5		0.5
Central Valley Fish Consumption Study <sup>c</sup>							
Central Valley Fish Body Burden Study <sup>c</sup>							
Determine sources of dioxins							
Assess human and wildlife hazard of consuming fish							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>
<b>Sacramento-San Joaquin Delta Totals:</b>		<b>0.0</b>	<b>1.9</b>	<b>0.0</b>	<b>1.9</b>	<b>0.0</b>	<b>1.9</b>
<b>TULARE LAKE BASIN</b>							
<b>Kings River, Upper (Ten Mile Creek)</b>			0.2		0.2		0.2
Monitor algal bloom problems near Cedar Grove <sup>(A)</sup>							
Monitor foaming problems in Ten Mile Creek <sup>(A)</sup>							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Kings River, Lower</b>			0.2		0.2		0.2

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
Assess high salinity drainage discharges							
Feasibility studies to reduce salinity							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Kaweah River - including Lake Kaweah</b>			0.2		0.2		0.2
Assess bacteria problems	(A)						
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Tule River - including Lake Success</b>			0.2		0.2		0.2
Assess water quality	(A)						
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Kern River - including Lake Isabella</b>			0.3		0.3		0.3
Assess water quality	(A)						
<b>Subtotal:</b>		<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>
<b>MTBE</b>			0.2		0.2		0.2
Monitor to determine sources, concentrations and risk to							
Beneficial Uses in Recreational Boating Reservoirs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Panoche Creek</b>			0.5		0.5		0.5
Assess extent of mercury, selenium, and sedimentation							
Evaluate feasibility of implementing BMPs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>	<b>0.0</b>	<b>0.5</b>
<b>San Carlos Creek</b>			0.2		0.2		0.2
Assess extent of mercury contamination							
Evaluate feasibility of implementing BMPs							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>	<b>0.0</b>	<b>0.2</b>
<b>Mendota Pool</b>			0.3		0.3		0.3
Assess water quality of groundwater pumped into it							

Table 2 – Staff Needs

WATERSHED/PROJECT	Program/ Funding Source (see footnotes below)	Staff Needs (PY's)					
		FY01/02		FY02/03		FY03/04	
		Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded	Funded (Reg. Bd.)	Unfunded
Assess salt loading from flows to the San Joaquin River							
Assess loading of salt and trace elements in releases to the wildlife refuge							
<b>Subtotal:</b>		<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>	<b>0.0</b>	<b>0.3</b>
<b>Tulare Lake Basin Total:</b>		<b>0.0</b>	<b>2.3</b>	<b>0.0</b>	<b>2.3</b>	<b>0.0</b>	<b>2.3</b>
<b>Regionwide Study Total:</b>		0.7	2.5	0.5	2.7	0.0	2.5
<b>Sacramento River Basin Total:</b>		0.1	1.6	0.0	1.7	0.0	1.7
<b>San Joaquin River Basin Total:</b>		1.8	4.5	1.8	4.5	1.8	4.5
<b>Sacramento-San Joaquin Delta Totals:</b>		0.0	1.9	0.0	1.9	0.0	1.9
<b>Tulare Lake Basin Total:</b>		0.0	2.3	0.0	2.3	0.0	2.3
<b>CENTRAL VALLEY MONITORING PROGRAM TOTAL:</b>		<b>2.6</b>	<b>12.8</b>	<b>2.3</b>	<b>13.1</b>	<b>1.8</b>	<b>12.9</b>

<sup>c</sup> Same study as is being identified in the group A pesticide work

(A) Surface Water Ambient Monitoring Program (SWAMP)

(B) OP Pesticide TMDL

(C) UC Davis

(D) Drinking Water

(E) Cooperative Extension

(F) Sacramento River Watershed Program (SRWP)

(G) GBP

(H) U.S. Fish and Wildlife Service (USFWS)

(I) GAF

(J) CA Department of Fish and Game (DFG)

(K) USBR

(L) U.S. Geological Survey (USGS)

(M) CALFED

(N) East Bay Municipal Utilities District (EBMUD)